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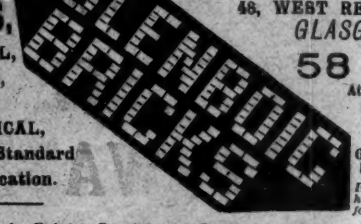

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VOL. CLXII., No. 3126.] WEDNESDAY, APRIL 11, 1923. [75TH YEAR.

EDITORIAL NOTES.

An Efficiency Department and Indoor Lighting.

LET us think of an Efficiency Department instead of a Maintenance Department in connection with consumers' fittings and appliances. An Efficiency Department seems to be some steps higher than a Maintenance Department. Maintenance, of course, is necessary to efficiency. There are, however, degrees of maintenance; and what has to be aimed at is to carry-on maintenance in the manner that will allow each appliance to give its highest efficiency, subject to intelligent use in the household. The line of gas consumption in which, in many districts, there is the greatest prevailing inefficiency is that of lighting; and yet lighting is to-day still the backbone of the business of a considerable number of gas undertakings. The evidence of the inefficiency exists in almost every district; and we venture to say that every gas manager knows of the presence of that evidence. Still negligence prevails; and the erosion of the lighting load continues. But we are thankful to say not everywhere. This fact shows that the lighting load can be not only maintained, but developed, if it receives the consideration that it should have. If it does not have the consideration and attention that it deserves and necessitates, then there is default on the part of the men responsible for the protection of the interests of gas undertakings. There have lately been signs of an awakening in this respect; and men who are looking to the preservation of the lighting load, and know from their own practical experience what can be done, have urged the importance of the matter to the industry.

The position is that in so many supply districts the gas-lighting conditions are of an order that mean certain further losses in competition, and there are in those areas the effects of the losses already incurred. The latter effects can be very largely repressed by ceasing negligence of the former. This is a view that is induced by the forcible paper which Mr. E. Edison Stones, the Assistant General Manager of the Glasgow Corporation Gas Department, read at the spring meeting last Friday of the North British Association of Gas Managers. If that paper does not succeed in carrying conviction, and in arousing responsible gas men to the need to be up and doing, then we do not know what form of stimulant is required to bring about a change of policy in respect of suppliers of gas doing their part in maintaining the efficiency of the lighting appliances in every consumer's house. Efficiency is the strongest protector that the industry possesses for not only the lighting, but every branch of the gas business. Inefficiency is its biggest enemy. Supposing the industry had continued to have to rely for life upon a single business—that of lighting—can one imagine that it would have allowed consumers' fittings and burners to drop into the miserable condition that is now so often to be found, without making an effort to effect a change? Mr. Stones declares that the broad basis of the industry has probably been the source of its greatest weakness, for we have had too many strings to our bow. There is no doubt a great deal of truth in that. We have looked upon the growing diversity of business as our greatest strength, and so it is in one respect; but if that strength induces neglect, in face of competition, to do our best to maintain possession of every member contributing to the strength, then Mr. Stones is right. Lighting has yielded to the attack of the competitor. The gas lighting load is still great; it would have been greater had we not lost some which was possessed. Why has there been this yielding, and is there a chance of more of the business going? Is the policy of the past, under which there has been loss, the policy that should be pursued in the future, in order to retain, to recover, and to develop? That is a question every gas man must ask himself. If the answer is in the negative, then there must be determination to change the policy, or to sacrifice more of the lighting business.

The question of a new policy is more important than it may appear to some who survey things somewhat superficially, and who do not look behind and below exposed conditions. Time was when Glasgow was pointed out as one of the models of all the commercial virtues in connection with progressive gas supply. Its policy was marked as second to none. It had a reputation for good deeds, and of efficient service. But those responsible for the working of the department asked themselves why certain things were; and this led the Engineer and General Manager (Mr. J. W. M'Lusky) to make a report urging upon his Committee the imperative necessity of a greater surveillance over the means of utilizing gas on every consumer's premises. The issue was that in a limited area in Glasgow, comprising 10,000 consumers, a trial scheme for the voluntary maintenance of gas-consuming appliances was sanctioned by the Corporation. The result is described in Mr. Stones' paper. That paper is an open and candid confession that the work of the Department in the service of the consumers and in the maintenance of the lighting business has not hitherto gone far enough. They have learned a lesson; and they are not ashamed to own up to it. "If," in effect they say, "we "have made the discoveries that we have done in this limited "area, then we must take it that what exists there has "existence in the other parts of the city; and it may be "assumed that—where there is not individual attention to "gas-consuming appliances, and consumers are left to their "own devices—in all parts of the industry, the same state of "things will be found. Thus there is a maturing of the con-"ditions for further losses of the lighting load." What has the Glasgow Gas Department found by penetrating behind once closed doors in the trial area? The paper tells us by reference to, and by photographs of, examples; and they are ghastly ones—yet only examples—of the awful fitting work to be found in dwelling-houses, and of ill-conditioned lighting fittings. Notwithstanding, the Glasgow gas supply has progressed and progressed. It has fine works and a fine organization; but the department have found a weakness in these days of competition, and that weakness is in the methods of utilization in the houses of the consumers. Mr. M'Lusky has done a great, and we believe it will prove a potent, service to the whole gas industry in permitting Mr. Stones, in this striking paper, to divulge the illustrations of an unsuspected crudeness and inefficiency in the lighting arrangements of Glasgow consumers. They are as interesting to us as the disclosures of Tutankhamen's tomb. Their dissemination will do as much good to the gas industry as the publication of the finest examples of well-designed, excellently finished, and highly efficient lighting appliances, because they show a weakness in our work and system which must be eradicated by persistent effort.

This state of things having come about under a policy which still survives, not only in Glasgow, but elsewhere, that policy requires to be abandoned, and a new one established. The Therm Charges Committee, as Mr. Stones aptly points out, recognized this when in their report they remarked: "If the gas undertakings were empowered *and* "*required* to inspect all fittings and appliances used by their "customers, from whatever source obtained, and to point "out the defects, the general standard of appliances in use

"would inevitably rise." We will not on this occasion enter into the subject of the work of outside fitters, nor the relations between municipal departments and local plumbers or other tradesmen. There is a known defect in our system; and the immediate question is, What is the line of policy that should be adopted to bring about a change, and so strengthen the resisting power of the industry in lighting competition? This is not an occasion on which, or a matter over which, we need think of any other interests but those of the industry and of the industry's customers. The policy advocated by Mr. Stones is the regular voluntary maintenance of burners by every undertaking. He says much else on many points, as will be found in reading the paper; but that policy of voluntary maintenance of burners we regard as the cardinal feature of the new commercial policy which the Glasgow Gas Department advocate as a result of the investigations they have been making in the trial area. Specially paid-for maintenance is a failure in that its attractions are not sufficient to make it universal. Because it is not universal, then inefficiency in lighting is more prevalent to-day—it is more prevalent to-day than when simple plain, wasteful flat-flame gas lighting was the highest standard of lighting within our field of view. And yet the incandescent burner (used properly) is an implement of vastly higher efficiency, but it is a grossly misused instrument. And while it has done much good to the industry, and will continue to do so, its misuse is destructive of the interests of the industry. We are writing bluntly, and with a purpose, because we are strongly persuaded that the policy of free inspection, advice, and maintenance (not including, of course, materials) as advocated by Glasgow—it is not submitted as an original idea—is one that is essential. It is necessary to see what is happening in houses, and to do what is possible to ensure that efficiency and not inefficiency reigns there. As Mr. Stones says, we are competing with an appliance in lighting that does not require regulation; and if we are successfully to compete with it, we must do what is needful to be equal to it. These are labour-saving days; and the public do not take kindly to labour of any kind that can be reasonably avoided, unless there is something that they recognize as offering compensation.

Efficiency in service is an insurance of considerable material value. Hence the view that every gas undertaking should have an efficiency-maintenance department. There is the cost. The cost is always regarded as an obstacle. But experience enables Mr. Stones to estimate the expense of maintaining all the gas-consuming appliances on the Glasgow district at 1½d. per 1000 c.ft. of gas sold, which, with a 500 B.Th.U. gas, would only mean 0·3d. per therm. He pleads for the price of gas carrying that 1½d. per 1000 c.ft., or 0·3d. per therm, for gas-using efficiency within the homes and premises of gas consumers. His cause is a good one. He contends that a door-to-door maintenance scheme is less costly to work than a scheme under which there are long distances between the customers who are willing to pay for maintenance service. Furthermore, the voluntary efficiency maintenance system would reduce the number of complaints, so that there would be a saving there. One thing, however, is highly important; and it is that only the best type of workmen should be employed for this duty. It is necessary for the efficiency maintenance men to know every type of gas-consuming appliance, and for them to be able to tackle any and every job which requires attention. This was pointed out by Mr. M'Lusky in the report to his Committee. To be successful, the scheme must be complete and efficient in its own constitution and working. The strongest arguments in its favour are the defective gas-lighting arrangements found to-day in consumers' houses, which serve as inducements for the transfer of business from the gas industry.

Showroom Modernization.

The old order changeth. This applies to gas showrooms as well as to other mundane things. Progress in all our affairs is an essential. The old showroom was not an attractive place. It was packed with goods of all descriptions, and resembled more a storehouse than a place for exposing goods from which a selection on merit could be made. But ideas have altered as to what is requisite in this respect. This has been imperative. When a thing ceases to attract the public, then it has had its day; and something new has to be devised. When, too, competition is all around us, it must be demonstrated to the public that our particular commodity is not only equal to any, but the best of all. This will not be effected by making a display of appliances after the manner of years ago, and by appliances which, more or less neglected, illustrated well how they would look if they were not treated respectfully and with reasonable attention in the houses of the consumers. An unsuitable and indifferently kept showroom, with bad display, suggests that gas is a sort of second-rate commodity; while the feeling and the knowledge which it is necessary to engender are that for any purpose to which it is applicable gas is something that is adaptable to any circumstances or surroundings, whether for light, heat, or power. Several gas undertakings, recognizing the influence there is in a well-appointed showroom, have had this part of their trading system remodelled and reorganized, with expert assistance. It is clear that the planning of a showroom is something upon which has to be brought to bear a knowledge of essential details; and acquaintance with essential details is only made by a broad experience. This is a point that must be emphasized, because the degree of success that is achieved in the mission of the showroom will have some relation to its fitness to serve its destined purpose. The gas showroom must attract, interest, and convince. If it does not do this with the general public—and particularly doctors, architects, surveyors, builders, and landlords—then it is a failure. That a gas showroom calls for the consideration and incorporation of many details, as well as the avoiding of unsuitable conditions, is seen by the article contributed to our columns to-day by Major F. Cornelius Wheeler; and he writes from an experience built-up from widely differing circumstances. Detail makes for completeness, success, and ultimate economy. This is an appropriate time to call attention to the subject. Commercial policy is a prominent feature among the several matters under consideration in the gas industry to-day; and the making of the showroom more efficient for service in the interests of an undertaking should not be overlooked. For years past there has been a disposition to put off to a more convenient season the remodelling and reorganizing of the showroom. But now material and labour are cheaper; and there should be a large revival by gas undertakings of the work of showroom and demonstration modernization.

Cooker Dimensions in a Series.

An article by Mr. Arthur Forshaw, M.Sc., bearing the title of "A Rational System of Cooker Standardization," is published in our columns this week; and it is a contribution to this highly polemical subject which, by manufacturers and buyers alike, will be regarded as containing some sound practical suggestions. Our contributor does not wish that it should be considered in any other light than as suggestive; and the measurements that he gives he does not desire shall be taken as definitive. But the very heading to the article indicates that, in the view of this student and investigator of what is requisite in cooker construction, the specifications and standardizations hitherto published have not achieved that degree of rationality which he conceives to be desirable in the interests of makers, buyers, and users. But this does not imply that the work that has been done by others to improve the thermal and domestic efficiencies of cookers is wasted effort. It is all to the good. What Mr. Forshaw is driving at is a greater co-ordination between the various makers, and between the cookers in a series, in the matter of structural dimensions, to the economic advantage of all concerned. And an investigation of the fundamental principles which should govern dimensions shows that it is quite possible for a series of cookers produced by one maker to have the same dimensions as those produced by another, and for most of the dimensions in a series of cookers to be the same—assuming, of course, common conditions, such as internal heating and open-bottomed ovens. It may at once be conceded that there is no particular commercial value in the matter of differences in dimensions, as between one maker and another, in a series of cookers. Variations in commercial value are found in that individuality which gives one manufacturer's cookers a higher thermal and domestic efficiency as compared with the products of another maker.

Looking through the makers' catalogues, Mr. Forshaw is struck by the extraordinary number of gas-cooker models that are offered for sale, and the bewildering variation in dimensions. There is no logical necessity for this, unless, of course, innovations contributing to higher efficiences compel a change in measurements. But on fundamental prin-

ciples alone, there is no reason why there should be so many differences in measurements in any series of cookers. Fundamental principles do not change; and requirements—such as the diversity of food to be cooked—are the same whether the cookers are made by Smith or by Brown. Mr. Forshaw deals with the fundamental principles, which are the same for all cookers of the common type; and there is no gainsaying that a consideration of them alone, without reference to individual features which improve efficiency, justifies the plea for co-ordination of several of the dimensions in the series of each maker, and of measurements generally as between maker and maker. Take the temperature conditions inside the oven. Heat is transferred from the source to the food by radiation and convection—radiation from the flames and the heated sides of the oven, and the heat transferred by convection is due to the products and the heated air passing through the oven. But the products have to be diluted and cooled before they can be utilized; otherwise there would be external burning of the food, while inside there would be under-cooking. These considerations largely govern the height of the oven; and another factor which has to be considered in determining height is the size and position of the flue-outlet. The outlet must not be so large that it allows the escape of the products before they have accomplished their work; it must not be so small that the products become banked-up, get lower and lower in the oven, increase in temperature, and affect flame efficiency. Care has therefore to be taken in regard to flue area, if the most efficient results are to be obtained. Given a well-designed flue-outlet, appropriately placed, then a minimum height of oven can be determined below which the best results cannot be realized. Mr. Forshaw states that the height is quite independent of depth or width, although we should, *primâ facie*, have imagined that the greater the scope for diffusion of the products within the oven, the less intense would be their up-thrust, given the same dimensions of flue-outlet. But Mr. Forshaw is emphatic on the point, and asserts that the height is independent of width or depth. Therefore, so far as height is concerned, he holds that there are no fundamental reasons why there should be more than one for any series of ovens. Depth is a matter of convenience, and so may also be a constant one throughout a series. The conclusion is arrived at that it is in the width that the provision must be made for increasing the cooking capacity of any oven in a series. It is urged that width should be decided on rational grounds, and not from a mere desire to multiply the number of models offered, or to tempt the buyer with an extra inch, compared with some competitive oven at a corresponding price. Thus heights and depths could be the same throughout a series, as well as burners and gates—only the width would vary.

The arrangements for attaching hotplates could also be the same throughout the series. Mr. Forshaw applies the same detailed investigation to the hotplate, the method of designing which has resulted in a veritable chaos. He examines the hotplate in detail, and makes suggestions, by the adoption of which all back burners, all front burners, and all grids would be the same for all hotplates of the series. The ideas submitted are well worth examination by those interested; for there is no question that it would be of advantage: To the manufacturer, to have fewer patterns and fewer diverse parts, which would be a near approach to the ideal of mass production; to the buyer, to have a smaller number of cookers, and therefore a smaller number of replacement parts to stock; and to the user, to be free from bewilderment in the choice of a cooker, and to obtain a reduction in price. Gas-cooker standardization on a rational system must benefit all concerned.

More Brakes on Industrial Progress.

All industries will regret to see the fresh disturbances in the industrial world, which will, if not speedily ended, result in further delaying general progress to prosperity. There is the trouble in the building trade. New houses are badly wanted throughout the country; but the economic conditions of the building trade are such that the masters have come to the conclusion that there must be lower rates of pay, and longer working hours in summer time, in order to restore matters to a state which will enable the industry to be conducted on a sound basis. The details of the masters' requirements need not be specifically referred to here. They expressed their willingness to have both issues—wages and hours—submitted to arbitration; but the Unions concerned were only willing that wages should be adjudicated upon, while the hours were to be regarded as sacrosanct. The result is that the masters have posted notices that the changes desired will come into force as from Saturday next. Therefore, unless there is a previous settlement, this will mean that some half-a-million men engaged in the building trade will stop work in a few days' time; and building will this year have a serious set-back. This will not be to the advantage of the country, nor to the industries which furnish constructional supplies, nor to those whose business it is to serve houses with commodities—for instance, gas.

But still more important, if the threatened development comes to pass, would be the complete dislocation of transport by a strike on the railways, over the proposal to abolish 6s. 6d. of the 16s. 6d. remaining of the 26s. 6d. bonus granted to the railway shopmen during the war, which would still leave them with 10s., while men working in the general engineering establishments throughout the country have lost the whole of the 26s. 6d. But the men's representatives hold that this violates an understanding arrived at in 1922, that in the case of the railway shopmen the bonus should be reduced, under the cost-of-living index figures of the Ministry of Labour, to the extent of 1s. for every five points dropped. It is not our business to enter into the rights or the wrongs of the matter at issue; each side is evidently of opinion it is right. It should, however, be easy to decide as to what was the understanding, without going to the length of a general strike in support of the shopmen by the members of the National Union of Railwaymen. It is stated that the Companies have made an offer to modify their first proposals, by withdrawing the amount in two instalments—3s. 6d. in the first instance, the remaining 3s. to be considered in three months' time, on the understanding that it be recommended for acceptance; but there has not yet been any development in this connection. Even if the representatives of the craft unions agree to accept, or recommend acceptance, of the Companies' modified offer, it is stated that the position will at once become acute, as the N.U.R. is opposed to any reduction of earnings. This at all events is the decision of a delegate conference of the N.U.R. The position thus created is well summed-up by the "Labour Correspondent" of the "Daily Telegraph." He says:

> **The delegate meeting of the N.U.R. has recklessly flung away the whole principle of collective bargaining by a trade union. What is the value of trade unionism if it is to refuse to negotiate; if a meeting of eighty delegates is to decide the issue of a strike not only without negotiation, but without referring the decision of industrial peace or war to their own members? The position created by this grave decision of the delegate meeting is further complicated by the fact that it is made upon a matter in which the members of the N.U.R. employed in the traffic service of the railways are in no way concerned. They are parties to the national wage agreement of 1919; the men working in the railway shops are not included in that agreement. By the national wage agreement, machinery has been devised for the consideration of all matters affecting wages, hours, and conditions of service.**

Then at the most inconvenient period to both themselves and the coal industry, nearly 50,000 miners in South Wales—chiefly in the Rhondda Valley—struck work with the object of forcing men who are not members of the Miners' Federation to become members. This was a development from the big coal stoppage of 1921. After that event, the colliery enginemen, boilermen, mechanics, and surface workers seceded from the Miners' Federation, and formed a Union of their own. There is a desire to demolish this separate organization; but the Mechanical and Surface Workers' Union have no intention of being either wrecked or forced to do what they do not want to do. The strike took place at a time when, the longer it lasted, the more serious it became for the industry and for home coal consumers. But it could not last long, and, in fact, came to an end at the beginning of this week. The South Wales men have grumbled and agitated more than any others about underpaid workers in their midst. Yet they were content to strike, and to take strike pay—so long as they could get it. But the funds available for the purpose were soon exhausted. Then there is the strike of farm hands in Norfolk, just at a most inopportune time of the year. In the pottery trade there is a threatened stoppage of some 60,000 men. The opinion of the workers in the heavy chemical trades throughout the country is this week being taken by the Trades Unions concerned on the employers' proposals to reduce

wages. Some 50,000 workers are affected. In other quarters of the industrial world, there are also movements to resist the further encroachments upon pay of improved conditions in respect of the cost of living.

All this unrest puts the brake on progress in the recovery of prosperity; and so far as industrial workers are needlessly taking part in it, so far are they bringing injury upon themselves, upon workers in other industries, and upon the country generally. For a large part of the trouble now existing, there appears to be no substantial cause. There was no reason for the attack on the liberties of men in South Wales; the question of hours in the building trade is certainly one that should be the subject of arbitration; the difference in the railway world is one that could be submitted to a judicial interpretation of what were the intentions in regard to the bonus of the railway shopmen. Yet men and unions place obstacles in the path to adjustment and peace, and will not recognize that necessity has claims, as well as they themselves—preferring, too, the threat of violent measures to attain their end, rather than the simpler and more honourable courses open to them.

Gas Poisonings and Population.

One of those extravagantly written articles somewhat common in the electrical papers has appeared in the "Electrical Review" from the pen of Mr. Hugh M. Goody. It is headed "The Lethal Pipe;" but it treats of several subjects besides gas poisonings or suffocations—subjects including the therm, the opportunity for the electrical industry, and the disadvantages under which it labours in respect of utilizing the opportunity. There is much that is weak and simple in the article when the facts are examined in their actual form. We will not trouble to deal in detail with the wanderings of the writer; for they are not worth the time that would be expended. Just one or two points, however. Mr. Goody states that during 1922 there were 112 cases of accidental death due to gas poisoning, excluding suicides, which nobody can prevent. Has he troubled to calculate how the accidents stand in relation to the population? If he has done so, then he will have discovered that they average 2·6 per million of the population! That is not a bad position when compared with other risks. There are two other questions. Has Mr. Goody found the total of the fatal accidents due to electricity? Does he know whether the 112 cases of gas poisonings were all due to town gas, or some of them to industrial gas, which contains a considerably larger quantity of carbon monoxide? In the statement which opened the recent conference at the Board of Trade on accidents to gas-mains and escapes of gas, Mr. F. W. Goodenough quoted the following passage from the evidence of Dr. Stevenson, of the Registrar-General's Department, before the Departmental Committee on Carbon Monoxide: "I would rather like to press upon the Committee the fact that these are exceedingly low mortality figures; the risk, after all, is quite slight." Mr. Goodenough also pointed out how considerably oil-lamp accidents have diminished since the introduction of the prepayment gas-meter system. Apparently it is too much to expect that men like Mr. Goody and papers like the "Electrical Review" should consider and write on these matters in proper perspective and with good reasoning.

The Thermal System of Charging.

The "Review" leads out the article—presumably to give it greater prominence, even the nonsense regarding the thermal standard and the new system of charging, respecting all adverse criticism of which the report of the Therm Charges Committee is wholly destructive. Yet the "Review" publishes this article. It will be conceded by all discerning men that, if consumers' accounts show so much "extra" in them for any given period, then it should find representation in the aggregate output of gas, and in the revenue of each undertaking. Will Mr. Goody or the "Review" put on their thinking caps, and then explain why it has not that representation. The Therm Charges Committee indicated that one could not consider effects merely on individual accounts, but only on the whole number, or on the total gas output and revenue from the sales. Every electrical manager must recognize the wisdom of this. But manifestly Mr. Goody does not; and, if the "Review" did so, it would surely have repudiated his statement "that there is a huge volume of evidence that household gas bills all over the country have increased under the new system of charging, and that considerably." Who is right—the Therm Charges Committee or Mr. Goody? The "huge volume" of evidence found in the actual trading operations of gas undertakings is that there has been no material general increase in gas consumers' accounts, other than that due to any necessary advance in the price of gas. But that was some time ago, and gas prices have, like those for electricity, been falling. However, on such considerations as those to which we have been referring, Mr. Goody arrives at the view that "widespread public discontent" with the gas supplied is obviously a state of affairs full of possibilities from the electrical point of view. That "public discontent" has a strange way of revealing itself, when we look at the recent growth in the number of consumers and of connections of gas-consuming appliances. The increase has been greater in the past year than in any of the seven preceding lean years. Mr. Goody says, too, that the gas consumer is in the unfortunate position of paying rather more than usual for "a greatly more dangerous commodity." Will Mr. Goody, or (if he cannot do so) the "Review," take the gas of any one company, and tell us in what way—chemically and physically—it is "a greatly more dangerous commodity" than (say) the gas of seven or ten years ago? We meet with some surprising things in electrical journalism.

Industry and Air Pollution.

The pressure that is being brought to bear by various means on behalf of manufacturers to modify any statutory intentions to promote better behaviour on their part in respect of smoke pollution of the atmosphere, is not going to have effect without opposition. The industrial representation is strong in the House of Commons; but there are other people who claim a voice in this matter. It will be remembered that Prof. W. A. Bone acted as the mouthpiece of a deputation of manufacturers (members of the Federation of British Industries) to the Ministry of Health, and he gave an interview to a representative of "The Times," on both of which occasions he opposed the strengthening of smoke-abatement legislation as against industry on the ground that it would, unless the greatest care was taken, imperil it, and absolutely ruin the commercial efficiency of trade. In the interview he proposed, as was seen in our editorial columns last week, a system of dealing with the matter, with the view of postponing legislation until industry had got well on to its legs again. Prof. Cohen, of the Leeds University, in a letter to "The Times," does not appear to be very impressed by the attitude of either Prof. Bone or the manufacturers. "Selfishness," he writes, "is a common human failing; and it is easy to excuse it in the present case on the plausible ground of undue interference with industry." He is of opinion that Prof. Bone has done scant justice to the work of the Smoke Abatement Committee, who fully recognized that in certain industries smoke is a necessary contingency. But, as he points out, by far the larger proportion of factory chimneys are boiler chimneys; and the Committee received unanimous testimony that such chimneys, if properly served, need not emit black smoke. Prof. Bone, if he desired to do so, could tell the Ministry of Health, Parliament, "The Times," and any interested person or body, of means of obtaining steam without the necessity even of having a chimney; and the expert of the London Coke Committee could give information as to how high boiler efficiences can be secured, with chimney shafts in existence, without the emission of black smoke.

Pure Air Abroad and the Reason.

The agitation is against the tightening of legislative obligation; and Prof. Cohen deals with this by asking a question, and himself giving an answer. He asks, Why are foreign industrial towns so clean, and free from industrial smoke? He refers Prof. Bone to the appendix to the report of the Smoke Abatement Committee. There he will find the answer. It is due to drastic repressive legislation. There "the onus of discovering the means of suppressing factory smoke is not thrown on the Government by the roundabout and expensive way Prof. Bone proposes, but on the manufacturer, with this result: That associations have been formed to maintain a scientific expert or experts who advise and assist the members in the economic use of fuel. It is through these that exemptions for certain industries are

applied for. This would necessitate the appointment of one or more scientific fuel experts attached to the Ministry of Health, as suggested in the recommendations of the Committee, who would be there to consider such cases, and to carry out the more important function of bringing pressure to bear on a defaulting local authority." That is a less cumbersome method than that proposed by Prof. Bone, as referred to in the editorial last week.

Creating Smells in Gas.

The "Engineering Correspondent" of the "Daily Telegraph" has been discussing this matter in a recent article. He points out that the mixing of water gas with its higher carbon monoxide content does not deprive coal gas of its characteristic odour, which provides it with the needful "note" of warning on an escape occurring; and the Board of Trade regulations stipulate that gases containing carbon monoxide shall not be distributed odourless. In some German towns where fuel gases are employed, the law demands admixture with the gas of a powerful "stench" capable of giving warning in time to avert explosions. The "Engineering Correspondent" mentions the qualifications of the agent producing a "stench." It must not be costly, it must be sufficiently disagreeable, and it must not exert a corrosive action on mains and pipes, nor must it be of a nature that on combustion has a contaminating effect on the air. Agents for creating stenches that have recently been tested for the purpose include phenyl isocyanide, amyl thio-ether, pyridine, amyl acetate, ethyl-hydrosulphide, and nitro-benzene. Phenyl isocyanide has an extremely strong odour; and although not at present available in commercial quantities, its production would not be unduly expensive—the cost, including admixing with the gas, probably not exceeding ½d. per 1000 c.ft. of gas. That would, in our view, be expensive for a fuel gas. Amyl thio-ether, with a given concentration, provides a very strong odour. Pyridine has a highly disagreeable odour. Amyl acetate would be cheap as a stench; but to many its odour is not sufficiently disagreeable. Ethyl-hydrosulphide is as powerful a stench as pyridine, but slightly more costly. Nitro-benzene would be exceedingly cheap as a stench; but, like amyl acetate, it is not disagreeable to many persons.

Detection of Carbon Monoxide.

Mentioning that carbon monoxide is very difficult to detect in air and in other gases, particularly when present in small proportions, reference is made by "Engineering Correspondent," in the same article, to the work of the two American investigators—Messrs. A. B. Lamb and C. R. Hoover—who have perfected a reagent consisting of fuming sulphuric acid and iodine pentoxide mixed with pumice. In the presence of an atmosphere containing carbon monoxide, this material turns green; the shade or depth of colour being practically proportional to the carbon monoxide content. The reagent is a corrosive, deliquescent material, and has to be kept in sealed glass tubes.

Summer Time.

It having been decided that summer time shall this year commence on April 22 and end on Sept. 16, the Early Closing Association are organizing a big campaign throughout the country to extend the operation of the Act to the 1922 period—viz., Oct. 8. The Association are receiving support from many local authorities and other organizations; and they want all the help they can obtain. The Secretary (Mr. A. Larking, of 34-40, Ludgate Hill, E.C. 4) would be glad to receive communications from trade associations who are willing to co-operate. As the French Parliament had not passed their Summer Time Bill before rising for the Easter Recess, it has been decided not to introduce summer time in France this year, nor is any attempt to be made to bring in any general measure of daylight saving.

The Economy of Ferro-Concrete.

In an extremely able paper, which Mr. J. Twist of the Swansea Gas Light Company contributed to a recent meeting of the Wales and Monmouthshire Junior Gas Association, he discusses the various applications of ferro-concrete to gas-works structures. He holds that in this method of construction, the gas engineer has a medium which will enable considerable economies to be effected—sometimes in initial cost, and always in maintenance charges. These economies are bound to be reflected in the lower cost of gas to the consumers.

PERSONAL.

Mr. F. W. CHURCH has been presented by the London, Oldham, and Dublin staffs of the Gas Meter Company, Ltd., with a gold hunter watch, suitably engraved, on the occasion of his retirement from the Secretaryship of the Company.

OBITUARY.

J. G. HAWKINS.

It is with regret that we record the death, on April 2, at Peterborough, after a long illness, of Mr. J. G. Hawkins, who, during the working portion of a life extending to close upon eighty years—he was born on April 7, 1844—took an active part in the affairs of the gas industry. At Association meetings he was a well-known figure and a frequent speaker; and a large circle of friends will cherish a remembrance of the genial manner which was the outward expression of a kindly nature.

Mr. Hawkins was one of the late Mr. Fisher's pupils at Taunton, and subsequently occupied the position of Engineer of the Wigan Corporation Gas-Works, during which time he was a member of the Manchester District Institution of Gas Engineers, before which, in 1880, he read a paper on "Gas Purification"—a matter to which he had given a considerable amount of attention. He stated then that at Wigan he had adopted the system of introducing a certain proportion of air at different points in his condensers, with excellent results as regarded his purification. In order that he might be enabled to ascertain the exact quantity of air required to keep the oxide of iron in good working condition, he attached a small meter to the condensers, and by drawing the air through it found that 4½ c.ft. per 1000 c.ft. of gas, or 0·45 p.ct., was sufficient. Mr. Hawkins took out a patent for his gas purification process, the advantages he claimed for which were: (1) Complete purification in closed vessels, whereby all nuisance caused by frequent change of purifiers is avoided; (2) a saving of at least 90 p.ct. in wages in the purifying department; (3) a great reduction in the ordinary wear and tear of the purifiers and their appliances, consequent upon less frequent changes; (4) an increased yield of gas per ton of coal, equal to about 3 p.ct.; and (5) increased illuminating power. His system was adopted at a number of works, including the three manufacturing stations of the Salford Corporation; and figures of the results obtained appeared in the "JOURNAL" at the time.

Upon leaving Wigan, Mr. Hawkins resided for a time at Peterborough—where his son-in-law, Mr. John Barton, is Gas Engineer. He subsequently successfully managed for some years the gas-works at Spalding, and then for seventeen years he held the positions of Engineer and Manager of the Wisbech Lighting Company and of the Wisbech Water-Works Company. In 1919, owing to advancing years and impaired health, he was unfortunately compelled to resign. During the time he was at Wisbech there were considerable developments in connection both with the gas and the water supply, which greatly benefited the district. On his retirement, the Directors, as a mark of their great appreciation of his long services, offered to suggest to the shareholders his appointment as a Director.

Mr. Hawkins was a member of the Institution of Gas Engineers and of the Eastern Counties Gas Managers' Association (of which he was President in 1900).

GEORGE FREDERICK LOMBE FOULGER.

There will be a great many in the gas industry who will share with us a feeling of deep regret on learning of the death last Saturday, at Hove, after a short illness, of Mr. G. F. L. Foulger, whose retirement 14 years ago from the position of Distributing Engineer to the Gas Light and Coke Company marked the withdrawal of a personality that had had prominent place in the active official work of the gas supply of the Metropolis over upwards of forty years. Mr. Foulger's outstanding good nature, combined with his technical ability, made him friends everywhere; and previous to his retirement there was widespread sympathy with him in a trial during which he displayed remarkable courage. Those readers who have by them the back volumes of the "JOURNAL" will peruse again with renewed interest two articles which appeared in July, 1909 (pp. 167, 233), referring to our late friend, and entitled "Incidents in a London Gas Distributing Engineer's Career."

It was in the year 1860 that Mr. Foulger commenced his long career in the gas industry, in the service of the old Ratcliff Gas Company, of which his uncle, Mr. Samuel Foulger, was a Director. With the Ratcliff Company he remained for four years, passing then into the North Woolwich Gas Company to fill an appointment which was destined to set him on the high road to his future position. Then in 1868 the Gas Light and Coke Company acquired their site at Beckton; and his undertaking being purchased in the following year, Mr. Foulger passed into the service of the Gas Light and Coke Company, succeeding Mr. Robert Harris as Chief Distributing Engineer to the Company in 1889. His long association with the Company covered a period of enormous growth in territorial and business magnitude. Originally there were thirteen companies supplying London; and this number was reduced to three. The articles already referred to showed that the responsibilities and duties of the office of

Distributing Engineer to the Company are immense and exacting, and demand no ordinary skill, and no ordinary strength of purpose and grip of affairs, and that all the attributes required to carry out these duties were possessed in distinguished degree by the deceased gentleman.

At the beginning of October, 1908, Mr. Foulger met with the misfortune—endured with the greatest fortitude—that led to his retirement earlier than would otherwise have been the case. Quite suddenly a malignant growth made its presence manifest, which necessitated the immediate amputation of a leg. From this ordeal he made a wonderful recovery. He felt, however, that the loss of a leg had depreciated the value of his services; and though the Governor of the Company (at that time Mr. Corbet Woodall) wrote cheering letters, and informed him that the Directors, his office, and his colleagues were awaiting to welcome him when he felt fit to return, Mr. Foulger determined to retire. The Directors received this decision with sincere expressions of regret; but arrangements were made to secure the benefit of his long experience by retaining his services in a consultative capacity, with recognition supplementary to his retiring allowance under the Company's superannuation scheme. His first appearance at Horseferry Road after his operation was in January, 1910, when he was presented by the chief officials of the Company with a beautiful silver rose-water salver. The presentation was made by Mr. D. Milne Watson (then General Manager of the Company), supported by Mr. T. Goulden, in the presence of all the subscribers. Subsequently he was the recipient of a testimonial from the employees in the distribution, chief inspector's, and stove and meter departments, which took the form of a massive silver Georgian tea and coffee service, spoons, and sugar tongs, in a polished oak case, with an illuminated address. On this occasion the presentation was made by Mr. Foulger's successor, Mr. H. S. Reeson (since succeeded by Mr. Stephen Lacey), who was supported by Mr. F. W. Goodenough.

Mr. Foulger remained a member of the Institution of Gas Engineers up to the time of his death.

The interment was yesterday (Tuesday) in Tunbridge Wells Cemetery; there being a service at St. John's, Hove.

At the moment of going to press, the sad news was received of the sudden death on Monday, during a meeting in the Town Hall, of Mr. William Chew, Gas Engineer and Manager to the Blackpool Corporation, in whose service he had been for half-a-century. He was 67 years of age.

Blue Lead as a Rust Preventative.

Some years ago, states the "Gas Age-Record," the American Society for Testing Materials, in conjunction with the Paint Manufacturers' Association of the United States, carried out a comprehensive series of tests to determine the relative values of various pigments in linseed oil for protecting steel from corrosion. Atlantic City was chosen for the purpose because of the unfavourable weather conditions, which would yield results in the shortest time. Fifty different pigments were applied to approximately 300 steel panels; and the tests extended over six years. Sublimed blue lead in oil was found to be the best among commercial pigments. Its rating at the end of six years was exceeded by only one pigment—American Vermilion (basic chromate of lead), which is too expensive for ordinary preparations. Sublimed blue lead is a basic sulphate of lead which upon analysis runs approximately as follows: Lead sulphate, 45 to 55 p.ct.; lead oxide, 30 to 40 p.ct.; lead sulphide, not over 12 p.ct.; lead sulphite, not over 5 p.ct.; zinc oxide, not over 5 p.ct.; carbon and undetermined substances, not over 5 p.ct. The major components of sublimed blue lead are in chemical combination; and a mechanical mixture of the proper amounts of exactly the same ingredients to give the same analysis does not in any way produce sublimed blue lead, and does not exhibit the same properties when mixed with pure linseed oil to make paint. The raw material employed in the manufacture of sublimed blue lead is galena—lead sulphide ore. The galena is mixed in suitable proportions with bituminous coal and slag, and charged into furnaces, producing fumes that come off the surface of the molten charge and pass into a collector consisting of a series of long bags. These bags act as filters, allowing the gases to pass out, and retaining the solid particles of pigment. The vehicle is just as important as the pigment in determining the quality of a rust-proofing paint; and up to the present no oil has been found that can be counted upon to give the service obtainable from pure raw linseed oil. Dry sublimed blue lead is a slate-grey coloured pigment of an almost impalpable fineness.

Wills.—Mr. Samuel S. Avis, who was Chairman of the Uckfield Gas Company, and who died at the age of 80, left estate of the gross value of £22,868. Mr. Peter Watson, late Chairman of the Ayr Gas Company, left, in addition to considerable real estate, personal estate valued for probate at £63,406.

The Experimental Gas Plant at Leeds University.—Prof. Cobb informs us that an addition to the equipment of the experimental gas plant which is being erected in the Department of Coal Gas and Fuel Industries at the University of Leeds by Mr. Henry Woodall, jun., has been made by the gift of a 100-light wet meter in cast-iron case by Messrs. Parkinson and W. & B. Cowan, Ltd.

ELECTRICITY SUPPLY MEMORANDA.

The attempt of the electrical engineers to effect, through joint discussion, an alliance with the architectural profession has not yet borne fruit. The respective bodies are, in the first place in Council, to consider what they have heard, to ascertain whether there are any ways, other than by the customary consultation when the architect needs special advice, by which they may have effective co-operation. It is plain from this that the co-operative ways are not any too obvious. The electricals have not been sufficiently wide-awake over this matter. The movement has evidently been made from their side; but they have not worked-up the architects to a complete appreciation of their ideas on the subject. And they will not do this by treating profession, as Mr. J. W. Beauchamp did in his paper, to a concoction of material chiefly composed of information that (as was shown last week in our editorial columns) disclosed a fair amount of bias, and a disposition to belittle the modern efficiencies of gas by quoting efficiencies which apply not to the most up-to-date appliances but to antiquated ones. The paper was in the main more suitable for a meeting of electrical salesmen than architects. The electricals, too, advocated that the architects should acquire a little knowledge of electricity—sufficient to guide them to the right electrical paths, but not sufficient to enable them to take the bread-and-butter jobs away from the electrical consultants. But the architects want to know why, if it is necessary for them to be in possession of more rudimentary knowledge of the electrical business, it should not be equally essential for the electrical engineer to be in possession of more architectural knowledge. The electricals approached the architects as though, of the two professions, the latter was the one that needed educating and help. But the architects very rightly say that while their electrical friends may be very good in their work, according to their own lights, they often make a pitiful hash of some of the fine conceptions of the architects—for example, by their inability to appreciate the need for light or shadow in the right places. The numerous ghastly instances, too, of the manner in which electricity is applied for lighting by electrical men is not an encouragement to co-operation. From the architectural side, it was suggested that a skeleton electrical specification should be drawn up which would help architects to do the right thing electrically; but that is just what the electricals do not want to do. Naturally they wish to be consulted in every individual case, and to draw their fees for their advice. One of the electrical speakers tried to frighten the architects by telling them of the difficulties and dangers that he had discovered in buildings through the absence of electrical counsel. This was Mr. R. J. Wallace-Jones. He mentioned two cases of old installations in wood casing, in one of which there had been fires through lack of inspection, and in the other he fully expected there would be eventually—the owners having taken somebody else's advice, and, for reasons of economy, decided to leave things as they were. Of course, architects do not relish the idea of seeing their work burned down; but the warning, coming from an electrical engineer, shows them that the risk of conflagrations exists just as much with electricity as with other agents for lighting and heating, and, in fact, the risk is of a more insidious character. Another incident in the discussion indicated plainly that architects are not to be tied to any one form of procedure. One of the speakers—Mr. F. Charles Raphael—asserted that Mr. Beauchamp had overdone the argument by suggesting that electricity was the best in every case. "The task of the consulting engineer is to advise what is best in the particular circumstances; and there are circumstances in which electricity is best, and others where gas is best." The editorial in the "Journal" last week showed that Mr. Beauchamp had inflated his pleading in more ways than one. The joint discussion leaves things much as they were—in fact, the exiguous attendance indicated an interest of the same order. Nothing has been decided as to the form co operation could or should take, and no one seems to have any decided opinion upon it. The architects are looking askance at the electricals' proposals; the electricals are wondering what was wrong with their bait.

Architects and Electricals.

Bi-Part Tariff and Heating and Cooking Supplies.

In December last there appeared in the "Memoranda" some notes on a paper by Mr. W. A. Gillott on "Domestic Load Building." From time to time, as has been indicated, there have been discussions on the paper at various centres of the Institution of Electrical Engineers. The contribution has lately been before the Western Centre at Swansea; and some of the remarks in the discussion are particularly interesting. A very frank speaker is Mr. J. W. Burr, the Electrical Engineer of Swansea. He obviously takes the sane view that it is ridiculous to profess adhesion to any proposal if not persuaded that it has in it any useful potentiality. Among his points was the one that he has not come across a two-part tariff which is satisfactory to both parties. In his view the "maximum demand" system is the best two-part scheme, and certainly it is the most equitable. Categorically he asserted that any two-part tariff that is not based on the maximum demand is no improvement on the flat-rate system. Of

course, all the speakers were not prepared to rank themselves with Mr. Burr in this opinion; but Mr. Stewart, of Llanelly, seemed favourable to continuing flat rates, on the ground that he finds it almost impossible to drill into a business man the necessity for a two-part tariff. Mr. Burr fully realizes that flat rates mean two separate meters and wiring circuits; but he prefers to simplify the tariff at the risk of duplicating the installation. This brought him to another point, and that an important one. It is beginning to cause a little agitation among engineers who have been developing business in low-priced units for heating purposes, and who find that, as darkness comes on and light is required, the atmospheric temperature in winter does not ascend. Therefore the peak of the day's load in winter is elevated by the superimposing of the heating demand on that for lighting. Mr. Burr agrees that to develop the heating and cooking load it is necessary to supply at a low rate. At the same time, it is only just that this class of consumer should bear a right proportion of the capital charges. That is precisely the reverse of the view of many electrical men who are out for full domestic electrification. They prefer to lump the whole of the capital charges on to the lighting consumer; and every lighting consumer has therefore to bear his proportion of the capital charges involved in supplying the heating and cooking consumers, though he may prefer, for economic and other reasons, not to be one of them. We are glad to see that a sensible view on this point prevails in some quarters.

Collateral "Advantages" of the Cooker.

To most people the collateral advantages of anything are regarded as of an abstract and not material order. Direct savings have a more immediate appeal than all the talk as to indirect advantages. Mr. Burr got away to other matters from the question of the form that charges should take. He holds that not enough is made of the indirect savings due to the use of electricity for all purposes. He submits that economies are effected in house decoration, wear and tear of furnishings, and domestic help; and these he maintains would in most cases cover the cost of the electricity consumed. Try to persuade a householder that this is so, and see what will happen! Mr. Burr also regards as a most important matter the educating of consumers in the economical use of electric appliances. No one will deny this, in view of the fact that heat provided electrically, even when the most rigorous care is exercised, is not what one would call cheap, even at assumed or actual efficiencies. As an evidence of the need for educational work, he stated that, at a recent electrical exhibition at Swansea, it was found that, while some ladies could cook a dinner for six persons—consisting of meat, two vegetables, and sweets—for a consumption of 2½ KW., others took three times that amount to cook the same quantity of food. But with all the educational work, one will not change the propensities of people either for economy or waste. The best educator in this regard is the pocket; but the electrical people know they cannot afford, if it can possibly be avoided, to allow the pocket to be the inducement to economy. People are already well persuaded that electricity as a heating agent is expensive; and electrical men do not want any further impressive attestation of this for "educative" purposes. Mr. Burr put forward another suggestion. It is that, though it would obviously add to the cost of the installation, it would pay to fix an easily-read meter on all cookers. But people must be getting tired of an accessory here and an accessory there as an aid to electrical use. The electric meter for the cooking stove would have to be very easily read to be of any value to the ordinary consumer. It would admittedly have its advantages and its disadvantages. It would show how expensive it is to use this form of energy for hotplate purposes, as well as that heating elements on the hotplate do not maintain even the 40 p.ct. or so efficiency of their pristine days. As to the hiring-out of cookers, Mr. Gillott had suggested 20 p.ct. per annum on the net cost. The 20 p.ct. tells a tale. Mr. Burr thinks it would be quite satisfactory from the supplier's point of view; but what of the user's? He considers that the makers should endeavour to put on the market an electric-cooker which would compare more favourably in price with the gas-cooker, and the electricity suppliers should hire-out at a figure lower than 20 p.ct. of the net cost.

Water Heating—Scrapping and Replacement.

Mr. C. Orme Bastian, in the "Electrician," says it is very arguable whether electric fires and ovens improve the load factor or the reverse. "The diversity factor varies in different districts, and a cheap rate for electric fires may not always be a paying proposition to the supply authority. Hot water is wanted, like bread, day in and day out all the year round. When all domestic hot water is provided electrically, a cheap enough flat rate will be possible for all purposes; and the necessity for complicated tariffs, which few of the public ever understand, will have vanished." This puts into a nutshell many things; but a big note of interrogation may be placed against the "When." Mr. Bastian has long been interested in electric heating problems; but apparently he has lost faith in domestic heating and cooking at low rates being generally a paying proposition. In the article before us, he is dealing with the supply of hot water by thermal storage—the electrical way. Two years ago he wrote on the subject of the domestic hot-water problem, but he cannot say that the electrical methods have made much progress in adoption. He finds there is an upper crust of prejudice to break through, which is yielding here and there. To help the electrical method Mr. Bastian has formed the amiable idea that there should be a general scrapping of the kitchen fire, gas-circulator or coke-boiler, and the hot-water pipes throughout the house; and these should be replaced with electric water-heaters at each point where hot water is required. Each heater for kitchen, bathrooms, and the nursery floor should be of the thermal storage type, and of sufficient heating capacity to cope with normal daily needs. Each should be fitted with an extra heating element to provide for reasonable emergency requirements. But Mr. Orme Bastian misses a most vital point in his counsel of scrapping and electrical replacement—that is, the cost of doing all this. It will vary in every instance; but he might have assumed a case, and given his readers some indication as to what was likely to happen in this particular.

The Bath Problem.

Then Mr. Bastian proceeds to deal with the bath problem. There is no reason, it seems, why the necessary limitation in the capacity of thermal storage heaters should fall short of real requirements. It must be remembered, he adds, that even with a full-size gas-geyser it is not possible to get more than two comfortable baths in an hour. We need not remember that, because in our own house we are afraid that three baths are often taken in an hour, using a gas-geyser. But it appears that with the 600-watt electric bath water-heater, for which Mr. Bastian's firm is responsible, two luxurious baths can be taken in much less than one hour. The thermal value of 600 watts being 2052 B.Th.U., this shows that the current must have been trickling into the tank at the rate of 600 watts for the previous twelve hours, so that we should call that two baths per twelve hours. Mr. Bastian calls it two baths in one hour. Of course, that is his joke. Obviously two persons cannot pick any hour of the day, and say "We will have two baths," and another two members of the family pick the next hour and say the same. There must be an interval of twelve hours before the necessary heat units have passed for two baths of 20 gallons each to be used in one hour, as otherwise sufficient heat will not have been transmitted to the water. Two baths in the morning and two baths at night are what Mr. Bastian kindly fixes as the extreme maximum demand for a bathroom in a well-arranged house. This indicates one limitation of the system. It brings us to another point. Two baths, he says, would entail a daily consumption of 7·2 KW.; and four 14·4 KW. Assuming the inlet water is 48° Fahr., and the bath water is 110° Fahr. the difference is 62°. Assuming, too, that 20-gallon baths are required, two of these would need, at 100 p.ct. efficiency, 24,800 B.Th.U. The 7·2 KW. provide 24,624 B.Th.U.; so that under the conditions assumed here, Mr. Bastian makes no provision for heat losses during the twelve hours. Whatever the readers of the "Electrician" may believe, we say frankly and without hesitation that we are not prepared to swallow that. However, 7·2 KW. at 1d. per KW. would cost 7d., or 3½d. per bath. That is very dear. Then Mr. Bastian says some people accept "such statements as appear in the Gas Press to the effect that four or five baths can be had for a penny, without taking the trouble to ascertain that this economical result is only arrived at by means of mixed bathing." Will Mr. Bastian inform us in which gas paper such a statement has appeared, so that we may ascertain exactly what was said? "The truth is," he proceeds, "that a bath from a one-year old gas circulator costs just about the same as an electrically heated bath, at 10d. per therm and 1d. per KW.-hour respectively." Now Mr. Bastian, our bathroom gas-geyser is eight years old. During that period it has received attention twice from a local gasfitter; and to-day the writer, at the price per therm in the district, gets about 10,000 B.Th.U. delivered for 1d.—not 3½d.—and finds this adequate for his morning bath in winter. It is not suggested that the water is at 110°; but it is as hot as is wanted. That bath is taken in ten minutes after the geyser is started—cold. What is the good of such postulation as is found in Mr. Bastian's article, when practical experience provides the contradiction?

Thermal Storage Effects.

We are promised a large-scale experiment at Poplar (due to the enterprising initiative of Mr. Horace Bowden), which will determine once and for all the relative cost of bath-water heating by gas and electricity respectively. Mr. Bastian says the cheap "off-peak rate" will then receive a fair trial, and doubtless other authorities will soon follow the lead given by Mr. Bowden. He concludes: "Water heating by thermal storage will then be possible on a large scale; and, properly developed, a system of large thermal storage tanks supplying hot water to blocks of dwellings or flats will remove the disability from which the electric industry suffers, owing to the fact that electricity can be stored only on a relatively small scale. These storage tanks of heat energy will improve the load factor just as much as a large electric accumulator could improve the load factor, with this added advantage, that the accumulation of energy will be at the consumers' end of the mains, and in the long run this means less buried copper."

The Council of the British Association for the Advancement of Science are nominating Sir David Bruce as President of the Association at their meeting in Toronto in 1924.

GASHOLDER DESIGN AND CONSTRUCTION.*

Reviewed by G. M. Gill.

The series of articles dealing with the design and construction of a 12½ million gasholder, which readers of the "Journal" will remember were written not long ago by Mr. R. J. Milbourne, has now been reprinted in book form. So little has been published dealing with the particular problems surrounding the design and construction of very large holders that this book is bound to be very acceptable and helpful to those engaged, or who contemplate being engaged in the future, upon a similar problem.

No one has calculated how much money has been wasted in building holders of too small a size, with the result that an additional holder has had to be erected before many years have passed. The disadvantage of this is that, as the author points out, the substantial economy in building large instead of small or medium-sized holders per unit of storage is lost for all time to the undertaking. This does not mean to say that it would be wise to throw caution to the winds and erect a gasholder of unwieldy size for the gas undertaking which is going to use it; but the advantage of the large holder is apparent when it is considered that if a 1 million c.ft. holder will cost, on a pre-war basis, £13,000, a 2-million holder will only cost £22,500; while a 6-million holder will cost £48,000 as compared with £72,000 for one of double its size. These figures are, of course, only approximate.

In his preface the author suggests that the time is coming when many large holders will have to be built in this country; and with this view many will agree, for the nature of the gas demand is changing rapidly. Wherever gas-fires have been energetically pushed, coupled with a low price of gas, there have been experienced sudden and heavy demands whenever cold weather has set in. Such spurts in gas output must always remind the management of the value of, and the necessity for, sufficient gasholder storage, the annual cost of which is invariably less than that involved in working with insufficient storage; while the increased security of the supply is a gain of no small degree.

That comparatively few holders have been built during the present century is easily explained by the extraordinary levelling-up of the day and night demand for gas; instead of the night demand being (as it was thirty years ago) many times greater than the day demand, it is now no more than equal to it in the majority of towns. This development has enabled gas undertakings to dispense with any thought of new holders, even when their sales doubled in amount; but it is now generally realized that the gas-fire demand is a "horse of another colour." On cold days many if not most gas-fires are lighted-up and continue to be used while the weather remains cold. Consider what demand this will be when the gas-fires outnumber the cookers by two to one—by no means outside the range of possibilities.

The writer does not propose to discuss in much detail the contents of Mr. Milbourne's book, which, it can be said at once, is an excellent description of a fine piece of work. It is of outstanding value to the industry, which stands to benefit by every properly told story of any new construction, so making things easier for those who come after. As Mr. Milbourne rightly points out, rules which have proved correct for small holders cannot be safely applied to large ones. The same is true of their working and adjustment. Engineers who have had experience with holders of very large diameter must have noticed the effect of temperature on the expansion and contraction of a holder, thus necessitating the readjustment of the rollers as the seasons change, if sweet working is to be assured. On small holders the change in size is too slight to make any apparent difference.

In connection with the dimensions of very large gasholders, a point of some interest is that in the United States holders are built of much greater height in relation to their diameter than are those constructed by British builders; for instance, the East Greenwich, Sydney, and the New York (No. 2) holders are virtually of the same diameter—viz., 300 ft. (the Sydney holder is of 297 ft. diameter); but while the first two have a height of 180 ft., the New York holder measures 260 ft. Similar proportions can be observed in most American holders. It is noticed that in the case of the Sydney holder the guide framing was taken to the top of the holder, for which design the author claims several advantages over that in which flying lifts are employed. As the author puts it, the saving in material by using flying lifts is not so great as might be supposed; while the flying-lift construction considerably increases the wear and tear on the guide-rollers, carriages, cups, and dips of the flying lift or lifts; also the rollers and carriages require much more frequent adjustment, repairs, and attention, to ensure their working properly, than with holders having the guide-framing carried to the full height. If the adjustment referred to received proper and skilled attention, the balance of advantage might still remain with the flying-lift design; but in the writer's experience the adjustment of rollers and carriages rarely receives the skilful treatment it merits, this being a much more difficult task than it is generally thought to be, and he is therefore in agreement with the author in his preference for guide-framing of the full height.

The wisdom of using radial crown sheets in preference to those of rectangular shape will not be questioned, the former being infinitely preferable, though more expensive. The same may be said of the construction of cups and dips, which were built of bent plates, these having distinct advantages for so large a holder over those constructed of rectangular sections. Mr. Milbourne will find few to disagree with his view that a system of tangential combined with radial rollers should always be adopted in large gasholders, as all must appreciate that by this combination wind pressure is much more widely distributed throughout the guide-framing.

It is not clear from the description or drawings whether the author placed the inlet and outlet pipes together or apart. In working holders there is so much advantage in having the two pipes at opposite sides of the holder that the extra expense in construction is fully justified. It has sometimes been taken for granted that gas of varying quality will, when passed into a holder, mix and become a uniform gas of the average quality admitted. This is by no means the case, the mixing being possibly 50 p.ct. efficient; and therefore there is every advantage in keeping the inlet and outlet pipes as far apart as possible. The author mentions that "two manholes and seals are fitted in the crown over the inlet and the outlet pipes." Presumably the author adopted the type of seal associated with the name of "Livesey," Sir George Livesey having been the inventor of this indispensable arrangement, by which ready access can be gained to inlet and outlet pipes without losing any gas.

The book concludes with an appendix in which there are given some useful particulars for gasholder designers, and includes the drawings of the 12½ million c.ft. gasholder built for the Sydney works of the Australian Gas Light Company. Altogether it is a very useful, interesting, and instructive book, likely to be of special value to those concerned with the design, construction, or working of large gasholders.

* "Gasholder Design and Construction." By R. J. Milbourne, A.M.I.C.E., F.C.S., Managing Director of Messrs. C. & W. Walker, Ltd., Donnington, Newport, Salop. London: Walter King, Ltd. Price 7s. 6d.

THE ANALYSIS OF AMMONIUM SULPHATE.

A Useful Indirect Method.

[From the "Chemical Trade Journal."]

In the majority of agricultural laboratories where fertilizers are regularly analyzed, the estimations of phosphoric acid in phosphatic fertilizers and of ammoniacal nitrogen in ammonium sulphate are frequently carried on concurrently. In the estimation of phosphoric acid, solutions and reagents containing free ammonia are freely used, and the atmosphere of the laboratory thus contains appreciable amounts of free ammonia which can easily vitiate the results obtained in the testing of ammonium sulphate by the Kjeldahl method. As it is not always possible to carry out the estimations in different rooms, another method of testing the nitrogenous fertilizer would appear advisable.

Dr. Richard Windisch, of the chemical laboratory of the Agricultural Academy at Kesthely, in Hungary ("Chemiker Zeitung," March 3, 1923), realized this fact, and has elaborated an indirect method of determining the nitrogen which is not affected by an ammonia-laden atmosphere. Though indirect methods of analysis in general are not favoured by chemists, yet in this case the error incidental to the process is not nearly so great as that caused by the interference with the Kjeldahl method. It was checked with the ordinary Kjeldahl method, and gave very close results. When applied to chemically-pure ammonium sulphate, the theoretical nitrogen content of which is 21·10 p.ct., the figure obtained by a series of tests was 20·94 p.ct.; and this difference of 0·16 p.ct. may be taken as the error inseparable from the method.

As finally elaborated, the method is as follows: 40 grammes of the ammonium-sulphate sample is dissolved in hot water, the solution cooled, made up to 1000 c.c., and filtered. From the filtrate 25 c.c. (= 1 gramme of the original salt) is evaporated to dryness on the water-bath in an accurately-tared platinum retort. When the solution grows very concentrated, but before any salt crystallizes out, 5 c.c. of methyl alcohol is added to prevent spurting. After dryness is reached, the heating on the water-bath is continued for a further 30 minutes. The dish is then transferred to a drying oven, the temperature of which is slowly raised to 120° C., and dried until it is of constant weight. This should take not more than three hours. The completeness of the drying must be carefully ascertained by repeated weighings. The salt is then very cautiously heated over a Pilz burner until fuming ceases. By continuous and careful regulation of the small flame, the heating must be so controlled that fuming ceases in about 30 minutes. The dish is then heated to a dull red heat, and weighed in the usual manner. The difference between the two weighings gives the amount of volatile ammonium sulphate, from which the nitrogen content can be calculated.

Yorkshire Junior Gas Association.—Next Wednesday afternoon (the 18th inst.) members will visit the works at Warrington of the Richmond Gas Stove and Meter Company, Ltd.

Iron and Steel Institute—The Institute are to hold their annual meeting at the Institution of Civil Engineers, Great George Street, S.W., on May 10 and 11, under the Presidency of Mr. Francis Samuelson. A long list of papers promised includes one by Messrs. E. R. Sutcliffe and E. C. Evans on "The Reactivity of Coke as a Factor in the Fuel Economy of the Blast-Furnace." An autumn meeting at Milan is being arranged.

A RATIONAL SYSTEM OF COOKER STANDARDIZATION.

Arthur Forshaw, M.Sc.

Anyone with sufficient interest in gas-cookers to go through the various makers' lists, must be struck with the extraordinary number of models offered for sale. Not only does this apply to the varieties in design and in construction, but also to the bewildering variations in dimensions, even among cookers similar in design, and includes hotplates no less than ovens. This state of affairs may be due to several possible causes with which I am not here concerned. Suffice it to say that most makers must have a considerable amount of capital locked-up in unremunerative cooker patterns; and they, along with the buyer and the user, would be benefited at the present moment if ovens and hotplates were fewer and less diverse in dimensions.

Let us examine the matter with more reference to first principles, and see to what conclusions they may lead.

Ovens.

The problem is one of applying, to some cookable material, heat of sufficient intensity, and for a long enough time, to bring about the necessary physical and chemical changes to make it palatable. Our source of heat is burning gas, with its accompanying gaseous products of combustion (hereafter simply products). Our mode of transfer of this heat from the source to the food is twofold—radiation and convection. The first is thrown out from the flames themselves, and from the heated walls of the oven; the second is due to the products and to the heated air which accompanies them through the ovens.

It is this latter form of heating which causes our first difficulty. If we could heat the walls of the oven uniformly to some predetermined temperature, we could make our oven just high enough to hold the food, and cook entirely by radiation (apart from the circulation of air within the oven). This is attempted with more or less success in coal-range, electric, and externally-heated gas-ovens. I am, however, now dealing with the more economical and widespread internally-heated gas-oven with two burners and an open bottom. In this the flames are at a temperature very much above that required for the actual cooking operation, as are at first the products. For this reason, they cannot immediately be brought into contact with the food without overheating or burning it on the outside—the inside being undercooked.

Dilution and cooling of the products then is necessary before they can be utilized; and this means space and time. Hence the height of the oven must be considerably more than would suffice merely to enclose the food, by this means ensuring that when the products reach the food they have been reduced and equalized to a sufficiently low temperature, through contact with the walls and by dilution and mixing, to cause cooking without burning.

These considerations govern the height of the oven. It is further governed by the size and position of the flue outlet. To realize this, it will be helpful to consider for a moment the somewhat analogous case of a lavatory basin into which water is running, and where we can actually see what happens. The direction of flow in this case is reversed. The water-tap, corresponding to the burner, is at the top; the waste-pipe, to the outlet, at the bottom; the bowl represents the oven; the water, the products. When the water is turned on, with the waste-pipe open, the level it reaches in the bowl depends on the rate of flow (the gas rate) and on the size of the outlet. If the latter be increased, the level will fall, unless the rate be also increased. If the outlet be lessened, the level will rise until, when completely closed, it will reach to the overflow.

Applying the analogy leads us to believe that, with a given gas-rate, the products will back-up in the top of the oven to a depth depending on the size of the flue-outlet. With a fixed size of outlet, this level will depend on the gas-rate. If the flue-outlet be completely closed, the products will back-up until, if they do not put out the flames and so cease to be formed, they escape from the bottom of the oven.

One must be careful not to press an analogy too far; and this one breaks-down in that the water represents, in a reversed direction, the behaviour of the products only—and that incompletely; for, first, they are much more mobile than water, and, further, when the gas-rate is increased, not only do they back-up to a lower level in the oven, but they are increased in temperature. At the same time, there is no parallel in the water-basin to the radiated heat from the flames and walls inside an oven. As a matter of fact, some gas-ovens are so designed that, were it not for this radiated heat, they would hardly cook at all. The products get away much too rapidly, through large flue-outlets, with consequent high and uneconomical gas consumption.

Without going into further detail, enough has been written to show that, with a well-designed flue-outlet, correctly placed, there is a certain minimum height of oven below which the best results cannot be attained; and—this the important point—this height is independent of the other dimensions, for increased width or depth make no difference to the up-thrust of the products. They merely entail an increased gas-rate to compensate for the greater loss of heat due to the larger external surface, and a proportionately increased flue-outlet to deal with the larger volume of products thus formed.

Above this minimum we are at liberty to increase the height within reason, and it is determined by the number of tiers of food it may be desired to cook at one time, and, further, by the height at which the hotplate top would remain accessible. This latter may be put at 36 in. above the floor as a maximum. As far as height goes, then, there appears to be no fundamental reason why there should be more than one for any series of ovens.

Turning, now, to the other dimensions, the depth from front to back is comparatively a simple matter. It is determined entirely by convenience—that is, by what can be effectively watched, attended to, and controlled in a hot oven by the cook working from the front. There appears to be no logical reason for successive increments of 1 in. or 2 in. in the depths of a series of ovens. Provided the first member of the series will receive a joint, the last cannot in depth do more, or convenience would not be served. It might be argued that the first member might take one loaf in the depth and the last two. In this case, the increment would be logically a large one once in the series, and not successive small ones. All things considered, I hold that the depth may be constant throughout a series.

We are left to consider the remaining dimension—the width. From what has already been written with regard to height and depth, we are forced to the conclusion that it is in the width that provision must be made for increasing the cooking capacity of the ovens in a series. The increment in width that should accompany each step in a series is a matter for further careful consideration; and on it depends the number of ovens in the series. At any rate, let it be decided on rational grounds, and not from a mere desire to multiply the number of models offered or to tempt the buyer with an extra inch, compared with some competitive oven at the same price.

In its entirety, the scheme which is the logical outcome of the above argument is that all domestic cooker-ovens of the type under review should, without exception, conform in internal linear dimensions to one or other of a number of specifications which together would make-up a complete series. The heights and depths would be the same throughout, as would be also the burners and gates. Outside these, the maker could exercise his individuality. One other thing common to all ovens of the same size, and to as many adjacent sizes as possible, would be the arrangements for attaching the hotplates, and so facilitating interchangeability of these latter.

Hotplates.

With regard to hotplates, the diversity is, if possible, even greater than among ovens. The method of designing them employed during many years has resulted in a veritable chaos. Had designers agreed that no hotplate should ever have the same dimensions or contain any single part in common with any other, not only of other designers, but of their own, greater confusion could hardly have been caused. It is quite the exception, even in a single series of hotplates, to find a part which will fit more than one member of the series. The explanation probably is that the three dimensions, width, depth, and height above the oven crownplate, have been settled with reference to appearance or to competitive considerations ("talking-points"), or to some reasons other than fundamental ones. Once these first two dimensions and the width of the cornice have been so decided on, it has been the practice, I believe, to make a full-sized drawing of the cornice. Pieces of cardboard equal in diameter to the various burner-heads, or in size to grill-plates, &c., have then been moved about within the inside edges of the drawing until some convenient arrangement has been come to. All that then remains is to draw-in suitable shanks or mixing-tubes to connect the heads to the gas-rail. It seems clear that such a practice would adequately account for the infinite variety to which I have drawn attention. At the same time, it has occasioned the placing of burners too near to the heavy cornice or to one another, and such-like faults, which are responsible in practice for the impossibility of making all burners work well and for the consequent loss of efficiency.

As with the oven, let us now look further into the various dimensions of the hotplate. Its height above the oven crownplate is determined by the distance it is necessary to leave between the underside of the grillplates and the food likely to be cooked in this manner. If the grill were separately arranged for, there is no reason why the burners should not be nearly touching the crownplate, provided the latter were removable for cleaning purposes, and a rack were available for warming plates, gravy-boats, &c. If the grill is incorporated with the hotplate, 6 in. is usually sufficient vertical distance to leave between the crownplate and the top of the hotplate grids.

The depth from front to back should be governed entirely by the distance which can be reached by the cook without effort, in lifting or examining utensils. On no account should there be more than two burners one behind the other, for the effect of the back ones cannot be adequately watched or controlled from the front. The depth, then, resolves itself into the least space into which two boiling burners can be put, and at the same time enabled to function properly without mutual interference. This would appear to be about a 4 in. radius from the centre of each. To enable extra large utensils to be used, an extra ½ in. in radius may be allowed. The essential depth, then, is 18 in. Beyond this, space must be allowed for the back and front cornices and for the tap-rail in front. Wide cornices have little to recommend them. They render much of the hotplate area inoperative; and strength may be ensured by vertical instead of horizontal exten-

sion. The total depth covering all these need not exceed 24 in., and may be less if due attention is given to the design of the grill-burners, which, being at the front of the hotplate, and requiring, as they do, a minimum length of mixing tube, are responsible for the minimum forward position of the tap-rail.

If we allow to each burner 9 in. in depth, it will require the same in width; and I propose to call this space (9 in. by 9 in., in which one burner is placed) a unit. The hotplate, then, is built up of units always a pair in depth, and as many pairs in width as is necessary to ensure the required burning power. One front unit is filled with a grill which, to get the necessary length of plate, projects a short distance into the unit behind. This can be easily arranged without interfering with the action of the boiling-burner in that unit.

A hotplate consisting of two pairs of units would be (say) 24 in. deep by 20 in. wide, and would contain one grill and three or fewer boiling-burners. One of three pairs of units 24 in. by 29 in. would contain one grill and five or fewer burners. To fill in this step from 20 in. to 29 in., a further hotplate 24 in. by 24½ in., with two pairs of units and one pair of half-units, is necessary—the last being arranged to take a straight burner or a simmering-burner. The pair of half-units can be combined with a single pair of units to form a fourth or smallest size 24 in. by 15½ in.

By adopting some such system as this, all back burners, all front burners, and all grids (cast to cover either one unit or a pair of units) would be the same for all hotplates of the series, as would also the half-unit parts, where they were utilized. The reduction in the number of patterns necessary to the establishment of such a series, and in the number of parts for its maintenance, will be apparent to anyone interested sufficiently to go into the question further.

The attachment of any of the hotplates to any of the ovens can be assured by the use of sets of bridges adapted for the purpose (though it is hardly conceivable that the largest size of oven would be required with the smallest size of hotplate, and *vice versâ*).

In an article of this description, it is neither necessary nor desirable to go into full detail, unless to elucidate some otherwise obscure point. I think, however, that sufficient has been written to show that the ideas put forward are worth a more detailed examination by those interested.

The advantages of such a scheme may be very briefly summarized as follows:

1.—To the maker: Fewer patterns and fewer diverse parts, a near approach to the ideal of mass production.
2.—To the buyer: A smaller number of cookers, and a smaller number of replacement parts to stock.
3.—To the user: Less bewilderment in the choice of a cooker, and a reduction in price.

In conclusion, I would say I am well aware that the scheme outlined is open to criticism in respect of details such as dimensions and the like, and it is not put forward as other than suggestive; but I believe the underlying principles which I have touched on to be sound. The gas-stove industry has been built-up, in a matter of sixty years, by clever commercial men; and they deserve every credit for the success of their efforts, which have provided us with such effective apparatus, and so large a variety of choice. In the course of those efforts, they may have had little opportunity to search for and formulate principles such as I have indicated. On the other hand, they may have discovered them, and have come to the conclusion that compromise with them was at the time a commercial necessity. Be that as it may, the facts remain that, judging by the general bulk of extant apparatus, standardization is very far to seek, and, further, that standardization on a rational system could not do other than benefit all concerned.

RECOVERY OF BENZOLE FROM COKE-OVENS.

A paper entitled "Observations on the Recovery and Rectification of Benzole" was presented by Mr. T. WESTHORPE, of the Langley Park Coke-Works, at the last meeting of the Northern Section of the Coke-Oven Managers' Association, which took place at Durham.

The author said that at his works the plant in use consisted of a battery of 75 ovens of the Otto waste-heat type, with direct ammonia recovery and naphthalene extraction. The exhausters were placed immediately before the benzole scrubbers, and scrubbing took place with the gas above atmospheric pressure and counter-current to the oil. There were three scrubbers of the tower type, of which they had a good opinion. Those referred to had worked nearly eight years, and had required no attention beyond the usual paint. The volumetric efficiency of the tower scrubbers, when working under proper conditions, was about 95 p.ct. The governing factors for maximum benzole recovery were: Sufficient scrubbing capacity; uniform arrangement of the packing; suitable quality and quantity of the wash oil; correct temperature of the gas and the oil; and correct gas velocity. The tower capacity should be ample—not less than 15 c.ft. per ton of coal carbonized per day, and more for the higher volatile coal; especially if the gas was not well cooled. Their packing was of the wooden-grid type; and the total resistance of the three scrubbers corresponded to 2-in. water pressure.

From their observations, they would consider the chief criteria for a satisfactory wash oil to be freedom from water, from constituents boiling below 220° C., from solids boiling above 300° C., from suspensions, organic and inorganic, and from low viscosity. The most important physical property was the viscosity at the scrubbing temperature, no matter what the constitution might be. This property determined the real usefulness of the oil for gas washing. Their best results when using coal-tar creosote or Scottish blast-furnace oil were obtained when the viscosity on the Redwood viscometer was 200 to 250 seconds per 55 cc. at 20° C.; and they tried to keep it within these limits as long as possible. This necessitated efficient tar extraction.

With regard to gas temperature, the lower this could be conveniently kept the better. At temperatures above 25° C., the falling-off in the recovery increased rapidly—particularly if, at that temperature, the viscosity of the oil much exceeded the upper limit previously stated. An increase in the oil circulated compensated very slightly for a rise in temperature of the gas above 25° C. Various figures had been put forward regarding the best temperature for the ingoing oil, at which to work the debenzolizing still; but even with the best of control a given equilibrium was not maintained very long. According to their experience, at least 50 p.ct. of the heating-up of the benzolized oil should be done in the heat exchanger; the actual temperatures to be attained depending upon the size and design of the still.

The amount of dry steam required was affected very materially by the condition of the heating tubes—*e.g.*, freedom from scale and pitchy films, which exerted a very great resistance to the transmission of heat. In their case, the benzolized oil contained approximately 2·5 p.ct. of washable product, when using creosote oil or blast-furnace oil as absorbents. The light oil tested 50 p.ct. at 120° C. on the retort. To allow it to rise much above this, lowered their yields. If the oil was not completely denuded of its benzole, there was certain to be loss at the scrubbers, even if all the other conditions were favourable. This necessitated the oil being heated to about 120° C. before entering the still. Light-oil stills were extraordinarily sensitive to the presence of water in wash oil; and they were equally sensitive to the variations in the oil flow.

It was their practice to wash benzole, toluole, and solvent naphtha all together, in the proportion in which they existed in the light oil. This procedure they found satisfactory and economical; 42 gallons (1·27 p.ct.) of "D.O.V." sufficing to wash 3300 gallons of the raw product. Seven gallons of "D.O.V." were first put through to dry the benzole. The remaining 35 gallons were then used to complete the acid washing. They recovered at the acid regenerator, in diluted form, approximately 20 p.ct. of the "D.O.V." used in the washing process, which left an actual consumption of 1·21 p.ct. to be debited to benzole washing. The average loss at the washer was 2·4 p.ct. of the raw benzole treated. These figures would no doubt be considered exceptionally low, which they really were; but there was an object in view, besides the economy of acid. While getting rid of practically all the bodies which could be sulphonated at the washer, they left in solution most of the polymerizable substances. These constituted the residue after final distillation, and were the basis of a grease which they made and used at their collieries and ironworks.

The alkali employed in rectification was soda ash, which was satisfactory and cheap. A 12 p.ct. solution was adopted, using for each batch washed 4 p.ct. of its volume. No water washing was done on the benzole after treatment with either acid or alkali, as this set up troublesome emulsions. The final distillation was carried out in a boiler still. The benzole to the National Benzole Company's specification was worked off from three charges in succession; after which the solvent naphtha which had accumulated therefrom was driven over until the tank tested 90 p.ct. at 160° C. on a retort. After shutting the still down, and allowing it to cool somewhat, the residue was run out and conveyed to the grease-making plant. Occasionally the washed benzole, after distillation, was slightly acid, owing to the presence of a trace of SO_2. It was then only necessary to agitate with clean water for 15 to 20 minutes to render the benzole perfectly neutral.

Royal Sanitary Institute Congress.—The 34th Congress of the Institute, to take place in Hull from July 30 to Aug. 4, will be presided over by the Right Hon. T. R. Ferens, P.C., J.P., High Steward of Hull. A full business programme has been arranged, and there will be visits to places of local interest. There is also to be a health exhibition. Already nearly 200 authorities have appointed delegates to the meeting.

London and Southern District Junior Gas Association.—A large turn-out of members is confidently anticipated for the visit next Saturday afternoon to the works of the Lea Bridge District Gas Company, with which their President (Mr. D. Cleave Cross) is connected. Much interesting plant is to be seen there; and there will be an opportunity of inspecting in course of erection by Messrs. S. Cutler and Sons a 2½ million c.ft. spiral-guided holder in a steel tank. For the business meeting at the Westminster Technical Institute on Friday evening, April 27, a lecture has been promised by Major W. Gregson (late R.E.), B.Sc. (Eng.), on "Recent Developments in connection with Gas Fired Steam-Boilers and the Utilization of Waste Heat for Steam-Raising Purposes."

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

Spring Meeting in Edinburgh.

THE Spring Meeting of the Association was held in Ferguson and Forrester's Restaurant, Princes Street, Edinburgh, on Friday afternoon last, when there was an exceptionally large attendance of members. Indeed, it was the general verdict that the turn-out was a record one for the Spring Meeting. In the early part of the day, the members mustered at Princes Street Station, and from there proceeded to the works of the Edinburgh Gas Corporation at Granton. Unfortunately, owing to illness, Mr. H. H. Gracie (the Gas Engineer and Manager) was unable to be present; but his Assistant (Mr. Jamieson) received the visitors, and showed them over the well-equipped works. On returning to the city, luncheon was served, and later the ordinary meeting was held under the presidency of Mr. JOHN M. SMITH, of Stirling. Supporting the President were Bailie Stewart (Convener of the Edinburgh and Leith Gas Commissioners), Councillor Gregorson (Vice-Convener), Mr. John W. M'Lusky (Gas Engineer and General Manager, Glasgow), Mr. E. E. Stones (Assistant General Manager, Glasgow), Colonel Peebles (Edinburgh), and Mr. David Fulton, of Helensburgh (Hon. Secretary and Treasurer).

A CIVIC WELCOME.

Bailie STEWART, as representing the Gas Committee of the city, said he hoped the members had thoroughly enjoyed their visit to Granton. It was rather unfortunate that Mr. Gracie was at present laid aside in consequence of a somewhat serious breakdown in health. Happily, the latest report was to the effect that he was improving, and they were hopeful that soon he would be back again to his duties. In Mr. Gracie's absence, he was sure that Mr. Jamieson had done everything he could to make them welcome at Granton. In Edinburgh, they were rather proud of the works at Granton. They might not have there the latest thing in the way of vertical retorts; but from the plant they had they obtained good results, and considered it was in every way in satisfactory condition. It seemed to him that they were fortunate in the situation of the works at Granton. Besides, there was a sufficiency of space, with the result that there was no congestion in the lay-out and arrangement of the plant. He had occasion frequently to meet gas engineers from different parts of the country, and had formed the opinion of them that they were an efficient body of men. It often seemed to him that the qualifications of the skilled and competent gas engineer were not fully understood by the ordinary layman. When they considered these qualifications, they were surely entitled to give those in the profession of gas management the highest praise for the way they performed their duties. Personally he felt that the gas industry had a great future before it. Certainly, they were all bound to acknowledge the service given by the members of the gas industry to the development of the country's trade and business.

Councillor GREGORSON also joined in the welcome.

The PRESIDENT briefly acknowledged the kindness of the Gas Corporation of Edinburgh and Leith in inviting the members to inspect the works at Granton. It was to them a matter for profound regret that Mr. Gracie was unable to be with them. Mr. Jamieson had, however, made an efficient substitute, and they were indebted to him and to the Commissioners for the hospitality and for the warmth of the reception they had received.

It was agreed to send an official letter to Mr. Gracie, regretting his absence and the unfortunate cause of it.

PRESIDENT'S WELCOME.

The PRESIDENT said the members had already been welcomed by the officials of Edinburgh; but he also would like to extend to them a few words of greeting. He was gratified by the fact that they had an attendance of members which had not been exceeded at the Spring Meetings for some considerable time. Members of the profession were present from both sides of the Border. He was sorry that the Chairman of the Stirling Gas Company was unable to be with them; but he hoped the Chairman and the full Board of Directors would be in a position to welcome the members to Stirling in September.

COUNCIL VACANCIES.

For two vacancies in the Council caused by the retirement according to rule of the senior members—Messrs. John Wilson (Motherwell) and T. W. Harper (Ayr)—the following were nominated: Messrs. J. D. Keillor (Hawick), James Gemmell (Melrose), H. G. Ritchie (Falkirk), Laurence Hislop (Uddingston), A. S. Nisbet (Paisley), and George D. Keillor (Greenock). The ballot will be taken at the annual meeting in September.

OUR LIGHTING LOAD.

Mr. E. E. STONES (Assistant General Manager, Corporation Gas Department, Glasgow) then read a paper on the above subject [which follows]. In the course of a few preliminary observations, he explained that the Secretary was not to blame for the fact that the paper had not been printed and circulated among the members prior to the meeting. He could assure them that Mr. Fulton had done everything he possibly could to get the paper through in time. The fault really lay with him (the speaker); and he had to apologize for the delay, which was wholly due to pressure of other work. In explanation of the exhibits which they saw in the room, he might state that he had caused the following circular to be sent out to makers of gas-burners:

Glasgow Corporation Gas Department.

INCANDESCENT GAS-BURNERS.

The writer has been invited to open a discussion on "Our Lighting Load" at the Spring Meeting of the North British Gas Managers' Association.

The discussion will undoubtedly embrace the suitability, efficiency, and convenience of present-day burners; and it has been suggested to me that the makers of gas-burners might consider it worth their while to have samples of their burners exhibited in the room during the discussion. Should you wish to embrace this opportunity, I have arranged that, if you will send samples of your burners to me, they will be duly exhibited for criticism.

Should you think it advisable for your representatives to be present at the meeting, I have no doubt that this can be arranged, failing which it would be well for the prices of the burners to be shown

E. E. STONES,
Assistant General Manager.

OUR LIGHTING LOAD.

By E. EDISON STONES.

Your Council having invited me to open a discussion on the above subject, the inference conveyed is that you will be prepared to continue the discussion. I sincerely hope that you will take full advantage of the opportunity offered for the settlement of an agreed policy. If this meeting is to be any more than a pleasant social gathering interested in the gas industry, we must make our respective attitudes clear, and, if possible, give a lead to other associations. Frankly, I shall try to draw discussion.

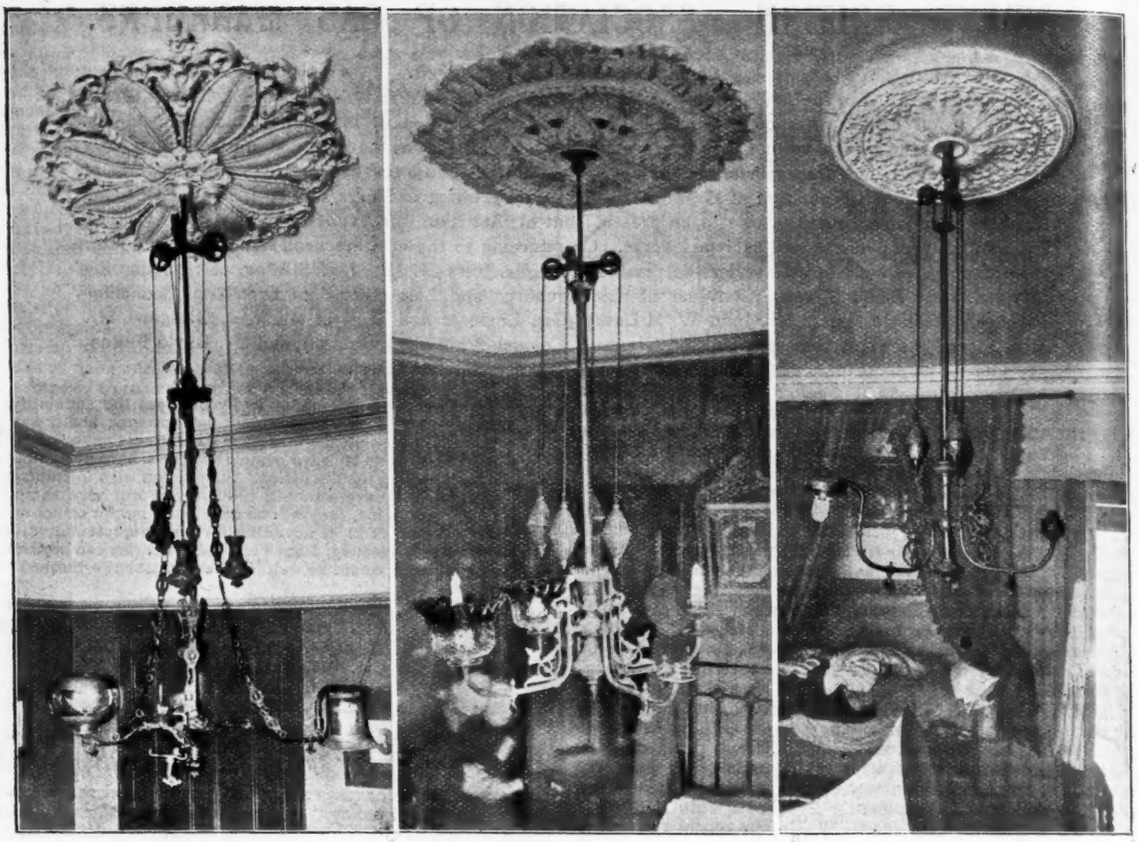
My object will have been achieved if I succeed in arousing you to a realization of the apathy which has settled upon us (in so far as our lighting load is concerned) and to a determination that if energy, enthusiasm, and a sense of personal responsibility can effect it, then gas lighting shall not be neglected in the future. The problem presses, and, turn which way we will, we cannot indefinitely elude it. Sooner or later its solution will be forced upon us, and better sooner than later. Our industry's broad basis has probably been the source of our greatest weakness, for we have had too many strings to our bow. Lighting, heating (both domestic and industrial), cooking, and power have provided a very large and varied outlet for our principal product.

The attack by our competitors upon lighting has developed slowly; so slowly, in fact, that its effect has not been suddenly felt in any one year owing to the extension of our business in other directions. Had the attack been simultaneously delivered on all our sales outlets, I am sure it would have encountered a very different opposition; and it is not to our credit that the damage done is not much more serious. On many occasions the subject has been treated from its economic side; the discussion has shown general agreement with the view that gas has a splendid case; the usual vote of thanks has been accorded—and nothing further has happened. Might I with all reverence suggest that something analogous to a revival is required within the gas industry, with converts having the faith of conviction so firmly rooted within them that they *must* tell others about it? However, the past few weeks has brought welcome evidence that this question is having serious consideration in many quarters.

The "GAS JOURNAL" of Feb. 28, 1923, in a leader column condenses its criticism into a few sentences. I will quote them:

> A great deal more attention is now being bestowed than was formerly the case upon the lighting branch of the gas business. We are not going to indulge in any incriminatory remarks on the subject beyond saying that indifference on the gas side has been largely responsible for much of the success that electricity has had in competition for lighting.
>
> We know full well that gas can hold its own in lighting in respect of economy and efficiency. But the gas industry—speaking generally—has shown itself a bad tutor, and has allowed in large measure the one point of convenience in electric lighting to over-ride merits of gas lighting that should have supremacy in competition if every point of relative virtue was brought into account. . . . First of all there has not been in the gas industry the effective campaign against poor and inefficient lighting fittings and burners that was necessary; and there has not been the consistent study of efficient installation for situation and purpose that there should have been. Tradition has continued to have considerable sway, and competition has not so thoroughly altered methods as one might have expected.

No one has entered a defence to the Editor's accusation against the industry. If I read aright what is in the Editor's mind, it is that with the exception of a comparative few, gas engineers have been, and still are, comfortably asleep, during which time electrical



PHOTOGRAPHS OF DEFECTIVE GAS PENDANTS.

engineers have had little or no organized or sustained opposition to meet, so far as lighting is concerned. By way of emphasis, might I repeat the last sentence from the "GAS JOURNAL'S" criticism—it will bear repetition:

> Tradition has continued to have considerable sway, and competition has not so thoroughly altered methods as one might have expected.

Mr. J. H. Brearley, in the "Gas World" of March 10, 1923, writing under the heading "Inspection of Fittings," says:

> Signs are not wanting that gas undertakings will be required, whether they wish it or not, to take a more active part in the inspection of fittings—lighting as well as heating appliances and piping—on consumers' premises. That is as it should be.

Again, at the Scottish District Conference of the British Commercial Gas Association, held at Dundee recently, Mr. J. W. Napier, of Alloa, speaking on the services rendered to the public, says:

> Let us consider lighting by gas. It is now felt that supervision of consumers' lighting burners is a proper duty to be undertaken by the gas authority. How many undertakings in Scotland perform this duty completely? The need is felt for this, and I am not aware of any objection to this work being carried out by every municipal and company undertaking in the country. It is surely not carrying out our promise of efficiency in the use of gas if we do not take the necessary measures to make certain that the consumer is obtaining satisfactory lighting value. A simple scheme of supervision and maintenance can be performed at small cost to the undertaking; the consumer, of course, paying for all supplies.

Perhaps the most significant comment, representing as it does the opinion held *outside* the gas industry, is included in the report of the Departmental Committee appointed by the Board of Trade to inquire into the method of charging for gas on a thermal basis. The Committee say:

> If they (the gas undertakings) were, moreover, empowered and required to inspect all fittings and appliances used by their customers from whatever source obtained, and to point out defects, the general standard of appliances in use would inevitably rise.

Mr. Napier put this message to the gas industry in another way when he said:

> It is surely not carrying out our promise of efficiency in the use of gas, if we do not take the necessary measures to make certain that the customer is obtaining satisfactory lighting value.

We must welcome these signs of increased interest, for gas authorities have been unaccountably indifferent to a competition which threatens the extinction of the most regular and valuable section of their business.

Might I submit the following questions:

(1) Can you imagine any other industry where competition would be so ignored?
(2) Would not any of the progressive firms engaged in the distribution of proprietary household commodities have instantly set about to combat similar competition, even to the extent of anticipating it?
(3) Why then do we remain so lethargic and complacent concerning our lighting load?
(4) Is it because the loss does not directly touch our own pockets?
(5) Is it because we have little or no difficulty at present in obtaining other business which compensates for any loss in the lighting section?
(6) Is it because we imagine that there is no effective reply?
(7) Is it because we know that to counter effectively the opposition will entail the setting-up of a new department, the overhauling of our business organization, and generally bringing ourselves and our staffs up to date in the matter of lighting?
(8) Or is it that we do not sufficiently believe in our own product as a lighting agent, and consequently our advocacy or advertisement of gas lighting smacks of lip service?

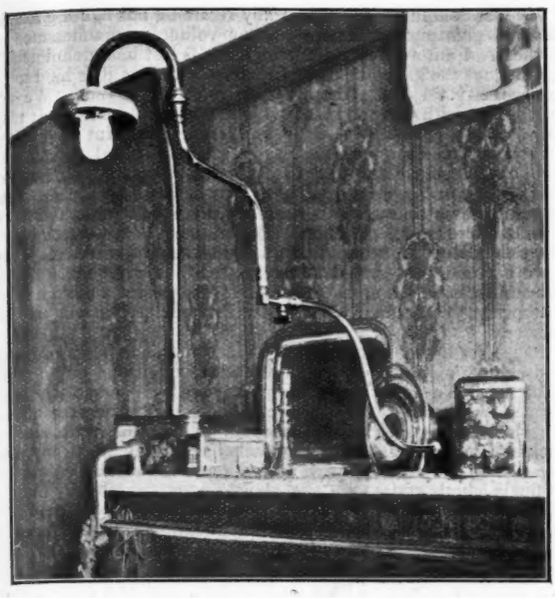
If these questions are not sufficiently comprehensive to describe our particular mental attitudes towards the advocacy of gas lighting, then I invite you to say exactly *where you do stand.* Something is wrong, it is futile to deny it; and I submit that it is our duty to the gas industry, as well as to ourselves, to first admit that we have sadly neglected this branch of our business, and then set to work to minimise the result of this neglect, no matter what peculiar difficulty we may encounter.

The problem is a real one; we must face it, solve it, and away with the method of the hunted ostrich.

Comparatively few men in the gas industry in and out of season have striven to keep this question to the fore. They have proved to us from their own experience that it is possible to combat electricity successfully. Mr. Sandeman has recently issued his annual report, which shows an increase in gas sold of 9 p.ct. for the past year; and I wish you to note this particularly—his department has sold during the past twelve months 2616 lighting fittings. With such evidence of what an enthusiastic belief in gas lighting and a magnificent sales organization can do, are we to sit down and say we cannot follow his example? Are we willing to try? Is our desire to retain this business deep and sincere enough to carry us into a fight for it, and have we weapons ready to hand? Are the makers of burners and fittings striving to give us ornamental equality with electric fittings, combined with increased efficiency? Are we encouraging them to do so?

Again repeating part of the quotation from the "JOURNAL:"

> . . . But the gas industry—speaking generally—has shown itself a bad tutor and has allowed in large measure *the one point of*



Another Striking Example.

convenience in electric lighting to over-ride merits of gas lighting. . . .

This one point of convenience being the switch, have our inventors and manufacturers of appliances said their last word? The distance controller and the pneumatic switch are the best available to-day; but who will say that they represent finality?

To anyone who is busy concentrating on cooking and heating appliances I would say: Do you realize that what you are gaining on the swings you are losing on the roundabouts, and that your actual progress is *nil;* that an attack is bound to be made on your cooking and heating load, and that, apart from the joy to be derived from a hard, clean fight, you are also missing the precious experience and preparation for that next assault? You cannot go on indefinitely "shifting your pitch" when attacked. Perhaps there is a man present who believes wholeheartedly in gas as a light giver, but lacks assertiveness. When interviewing a potential customer, he thankfully takes all the orders which are given him, meanwhile subconsciously debating within himself as to whether he shall mention gas lighting. His timidity on this subject will not secure much lighting business. To many men in charge of country works where up to the present it has not been possible economically to generate electricity, a splendid opportunity occurs. Do they take an interest in the street lighting? No, that is the surveyor's job. Or in the cleaning, adjustment, and modernizing of the private house fittings? No, that is the plumber's job. Between the surveyor and the plumber gas frequently gets a very indifferent show, with the result that at the earliest opportunity the consumers appeal to some electrical authority to come in; and away goes a good portion of the lighting load. The point I am seeking to make is that such an attitude of indifference—"so long as the job will last our lifetime"—must cease, for assuredly our customers will not put up with it.

Among the questions I suggested for consideration was this:

> Or is it that we do not sufficiently believe in our own product as a lighting agent, and consequently our advocacy or advertisement of gas lighting smacks of lip service?

Imagine a gas official reducing himself to such argumentative impotency as he must do if he instals electric lighting in his own house. Yet we have a case of this kind in Scotland; and if the gentleman responsible for it is here to-day, it will be interesting and instructive to hear exactly the kind of argument he would adduce to any of his gas-lighting customers desiring to imitate him. So much has been made of this case that one hopes every official within the gas industry will shield himself against the taunt that his precept is better than his practice. The British public has an unerring instinct for detecting if personal conviction lies behind any advice tendered; and it is surely only reasonable to expect that if you advise others either vocally or by advertisement to use gas for lighting, you must employ the same method yourself. If we cannot afford the chief to set a bad example neither can we afford any man on the staff who imagines that the day of gas lighting is past. We shall be better without such men, who never miss an opportunity of crying "stinking fish."

A different mental attitude is that of a young man at a comparatively small works who, not intending to stay, is constantly on the watch for some larger works which will provide him with an opportunity to show his worth. He is unsettled, and does not attack the lighting business. Surely that is a short-sighted policy, for if there is one class of work more than another which will show good results and make a favourable impression on boards or committees appointing new managers, it is the success which he has achieved in this direction.

It would be interesting to hear the views of a man entrusted with the management of a joint gas and electricity department. What guides him in his recommendation of gas or electricity for lighting? One side or the other must suffer; there being no man absolutely impartial. We have a class of member represented here to-day, perhaps only indirectly concerned, but representing as they do the plant and appliances side of the business; their attitude is of the greatest importance. They depend for trade upon the successful operation of gas departments. Gas lighting provides dividends for shareholders and principals, salaries for representatives, and wages for employees. What is their attitude towards gas lighting? Do they use it in their own homes, offices, and works? Do they realize that they can be most useful advertisements in its cause? Gas lighting still forms the greatest part of our business; and if it flags, these firms will be the first to suffer. If these people do not use gas for lighting, will they accept this invitation to furnish the reason? There is an imperative necessity for all in the industry to pull together; and if we can speak from actual experience, our influence will be much stronger.

What then are the essential conditions if we are to throw off that apologetic manner when discussing gas lighting? There is no need to be apologetic if our installation is suited to its purpose, properly installed and maintained; and very briefly I propose to recite what in my opinion are the conditions necessary if we are to retain our lighting load:

(1) A plentiful and governed supply of gas to the burner.
(2) A regular quality of gas.
(3) The very best quality burners—ornamental, lasting, and efficient.
(4) Regular voluntary maintenance of burners by the gas department.

If you have not already examined the sample meter connections which have been placed here for your inspection, I invite you to do so. They are taken from a district in Glasgow where, over a limited area comprising 10,000 consumers, a trial scheme for the maintenance of all gas-consuming appliances has been sanctioned by the Corporation. These samples speak far more eloquently than I can hope to do in my advocacy of voluntary maintenance. They are representative specimens. Is it a matter for surprise that the consumers could not obtain a sufficient gas supply? With one-ring burner lighted, the lighting had to be suspended—silent evidence of wretchedly careless fitting I admit, but the point I wish to make is that this represents present conditions in a far larger area than the experimental maintenance area. Do you know your districts sufficiently well to say confidently that nothing like this exists, and that all your customers get a plentiful supply to the burner?

We will not here discuss whether the gas supply shall be of high or low grade quality; but that it must be of consistent quality cannot be refuted, if satisfactory lighting conditions are to be obtained.

My next condition is that none but the very best burners are good enough. I submit for your inspection samples of burners gathered from the Glasgow trial maintenance district. Such burners as these are the appliances which we are allowing to demonstrate the efficiency, or rather inefficiency, of gas as a lighting agent. Can we reasonably expect anything but disaster to follow such a policy? I am aware that the managers of municipal departments are not altogether blamable in the matter, as pressure can be and is brought to bear on their committtees to prevent the sale by their departments of burners and fittings under the pretence that it is an interference with private enterprise.

The Master Plumbers' Association is a particularly powerful body in Scotland, and it is useless to think that the master plumber will allow himself to be eliminated from the selling of gas burners. He regards it as his legitimate sphere; and although he neglects it, it is only when one attempts to touch the business that one realizes how jealously he regards your interference. Some weeks ago I was informed by a master plumber that they, as a body, resented the Corporation selling anything to the public. That was their job, and they were prepared to do it. I suggested that if this was so, would he mind telling me what make of superheated burner he considered to be the best. The reply was, "If I got the chance of a lighting job, I should send to my wholesalers and get the latest catalogues." A campaign among the plumbers is very much overdue. The plumber and gasfitter is frankly out for profit; and if trade in gas fittings does not come along, then he stocks electrical fittings, and he is encouraged in this by the electrical manufacturers. These manufacturers advertise on a very large scale, sowing the seed, and the private plumber reaps a share of the harvest. Advertising in the daily papers is not often devoted to gas-lighting burner advertisements; and we cannot wonder that the private trader encourages this branch of his business to our detriment, seeing that the gas industry offers no equivalent advantage. No! Our only legitimate grumble against the plumber is that he often plays "dog in the manger." What, then, is the remedy? I will make some suggestions, not new ones—they have been mentioned before, but I ask you when considering them to imagine yourself sitting in the chair as a private tradesman. What would attract you away from a good paying proposition? Something as good or better. Then what you would ask, be also prepared to give. How can we do it, you say. By encouraging the private plumber to lean upon your department, making the fullest use of your showrooms and staff, by crediting him with any profit which may

accrue from an introduction of business which he may make—interpreting the term "introduction" liberally; and by making the work attached to the transaction as light as possible so far as he is concerned. Should he introduce business, allow him to do the fixing on an agreed schedule basis, bearing in mind that, like yourself, he wishes to keep his workmen employed. Profit on fittings occurs once only; but profit on gas sold occurs every day. Therefore, make friends with the master plumbers in your district; and if they number 700, then you have 700 potential salesmen for gas fittings.

To stop the importation of cheap foreign rubbish sold as gas burners, is a problem not easy of solution. Various suggestions have been made to deal with this difficulty, but still the "complete burner for 6d." comes into the country in greater quantities than ever. Surely this is a matter for the National Gas Council to take up with the Government. I will quote an incident which occurred in Glasgow a few months ago, showing how other industries seek to protect their business interests. The Department of Customs and Excise made inquiries concerning the quantity sold, prime cost, and country of origin of the flint-lighters used for gas appliances. The match manufacturers of this country were reported to have claimed that their industry had been seriously hurt through the introduction of patent lighters, and were approaching the Government with a view to an increase of import tax on these articles—in other words, to discourage their import.

Surely the gas industry have a much stronger case to put before the Government, seeing that it is not only in our own interests, but as a means of protection to our customers that we wish to have foreign burners excluded from the country. Until they are unprocurable we shall not prevent certain sections of our customers purchasing them. At the "B.C.G.A." Bristol Conference I understand that a Birmingham delegate repudiated the idea that any of this shoddy stuff emanated from that city. Is London, Leeds, Manchester, or Glasgow equally free from suspicion?

You have observed some of the samples of so-called burners collected from the Glasgow experimental maintenance district, which are exhibited here to-day. Everyone will agree that the traffic in such horrible contraptions should be made impossible. But how? Our Technical Press can help in this direction, by refusing advertisements from any firm dealing in this class of goods. It may appear a form of "substituted suffering" on their part; but I think, if appealed to by the National Gas Council, they will see the desirability of making it impossible for firms of otherwise good repute to stock these cheap lines. In our showrooms we must stock only the very best burners and make our lighting display as attractive, as convenient, and as ornamental, as do our competitors. Pay a reasonable price for your burners; do not make a habit of accepting the lowest offer.

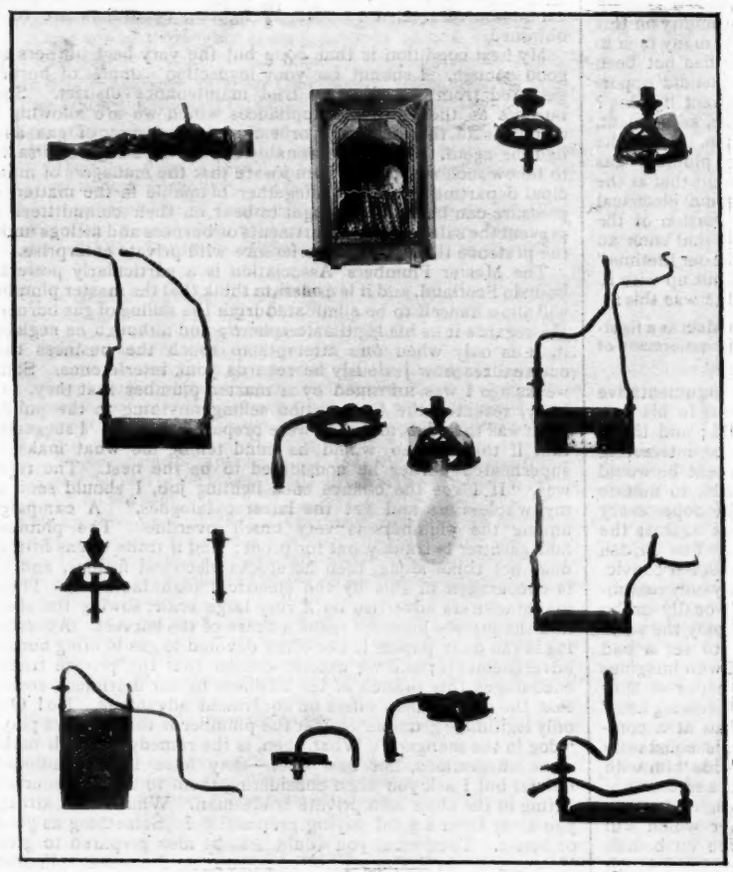
My last condition for successfully retaining our lighting load is that we give our customers regular voluntary maintenance of burners. I am aware that this opinion is not held unanimously throughout the gas industry. In some instances it is held to be unnecessary. I will state my case for maintenance. We are competing with an appliance which, whatever demerits it may have in other directions, does not require constant regulation. If you are to compete with it, you must be equal to it. The public will suffer being told to clean and regulate their burners just so long and not one day longer than they find it convenient to change over to some other method, irrespective of the cost, if it entails less trouble to them. The public whom we serve have been educated in other directions to demand service. They have become accustomed to having many things done for their convenience and comfort, of having every desire anticipated by enterprising tradesmen who realize that the public will pay for service.

Pause for a moment to think of the difference in an ordinary householder's life when compared with conditions only twenty years ago. To-day shopping is made easy by means of the telephone; tradesmen's canvassers call each day for orders; houses are cleansed by means of a vacuum pump and flexible tubes sucking the dust away to a receptacle in the street; our morning paper is on the doorstep with the milk and the rolls. We do not willingly climb stairs—we use elevators or escalators. Shortly we shall not attend the opera house—the opera will come to us by means of wireless. How then can we as an industry ignore the undoubted sign of the times, and still expect our customers to clean their own burners? They did this twenty years ago, but they simply will not do it to-day; and as a consequence they either report "bad gas," or adopt some other means of lighting. Have you considered how much hidden and unanalyzed expenditure is contained in your balance-sheet each year? A complaint of "bad gas" you will willingly attend to, even if on examination it proves to be the cleaning and regulating of burners which is required. Why not recognize at once that this work is necessary—just as necessary as the complete removal of ammonia or sulphur. The cost should be charged to the distribution of gas, and I suggest that a better rendering of that term in our accounts would be "efficient distribution of gas."

For your guidance I might mention that the estimated cost of maintaining all gas-consuming appliances on the Glasgow district is 1½d. per 1000 c.ft. of gas sold. I commend this to your consideration when next recommending a reduction in price per 1000 c.ft. or therm—leave 1½d. for efficiency. I have had experience of a maintenance scheme whereby customers on application could have their burners cleaned and regulated at varying intervals; but only a comparatively small proportion availed themselves of the system. Moreover, it is more costly to work per unit appliance than a door-to-door scheme, which, in my opinion, is the gas parallel to the other modern service conveniences just mentioned. When you decide to adopt a full maintenance scheme, I suggest that only the best class of skilled labour be employed. Nothing short of this is good enough, and I will quote an excerpt from the report made by my Chief to the Glasgow Gas Committee, when our experimental scheme was being considered.

> It is obvious that if regular maintenance is put into operation the number of complaints received at the various depôts will be greatly reduced, and a proportion of the existing staff will form the nucleus of the maintenance staff. The remainder required to cover the whole district will have to be recruited and trained. In this connection I strongly urge that only the very best type of workman is good enough. It would be necessary for him to tackle every kind of job, and to be conversant with all gas-consuming appliances.

I appeal to you again for a free and frank statement of your attitude in relation to the subject under discussion. Say if you agree or disagree, but do unburden yourselves. Don't toy with the matter any longer. I am speaking to some who are already converted; others are waiting for a lead. Let them have it to-day. We are all anxious to retain and increase our lighting load. Concerted enthusiasm will secure it; but make no mistake, we shall have to put our best into the job. Enthusiasm is infectious. If we show an intense interest in gas for lighting, our several staffs cannot help imitating our example; but to be effective and convincing to the public it must be enthusiasm born of conviction. Has each one here got that particular kind of fervour? If so, we shall have no lack of discussion to-day, and, I trust, action to-morrow.



Some Appliances and Connections Found in the Glasgow Experimental Maintenance Area

Discussion.

The President (Mr. J. M. Smith, Stirling) hoped, for the sake of the industry, that the majority of the points to be raised by the

members would be at variance with the author's views. Undoubtedly, Mr. Stones had given them something to think about; and if all that he represented was true, it disclosed an appalling state of affairs. He trusted the members would thresh the matter out thoroughly. Personally he failed to discover any reason whatever why they should not retain their lighting load. In Stirling, away back in 1898, an attempt was made by the Town Council to purchase the gas concern. After a prolonged talk and many heart-burnings and heart-searchings among prominent townsmen, the Council came to a decision that they would not buy. As an alternative to this, they inaugurated electricity. It was rather interesting that it was only within the last three years that the municipal electricity works in Stirling had been able to make both ends meet. Of course, the gas lighting load had deteriorated, chiefly because of the fact that the whole of the current generated was utilized for public lighting; and it would be recognized that it was practically hopeless for any private company to compete against this.

Mr. C. W. FAIRWEATHER (Kilmarnock) thought Mr. Stones was to be congratulated on taking-up this subject. The retention of the lighting load ought to have a real interest to all in the profession. Some time ago in Kilmarnock they adopted a system of examining and attending to gas-cookers and gas-heating appliances. Further, all complaints were fully investigated; and this arrangement was found to be an excellent one. There was no doubt that many of the things Mr. Stones had suggested were logical and feasible. There was no reason at all why the major portion of the lighting load should not be retained. Every undertaking should look forward in some way to the retention of the lighting load; for, after all, it represented a very large proportion of their business.

Mr. DAVID VASS (Perth) said it might be interesting if he referred to his own experience in Perth, where the gas department had a showroom. There they exhibited fittings; but, of course, the sales were made through the plumbers. In Perth they were probably unique in that they had neither there nor in the immediate vicinity any large wholesale houses. The result was that the plumbers came to the gas department for all their supplies, and held no stocks at all on their own premises. This might be considered a drawback; but it was one of those drawbacks which the gas department faced. They recognized that in their showroom they had to keep abreast of the times, and to exhibit the most up-to-date appliances. He might explain that the margin of profit which came to the plumbers in Perth was the same as they obtained from wholesale houses in Glasgow or Edinburgh. On the other hand, the margin of profit derived by the gas department was quite sufficient to pay them for any little extra attendance required in the showroom. At one time he thought of carrying out a maintenance system at a small charge. The experiment was tried, but was not a success. As a matter of fact, very few took advantage of it. No doubt many of the gas corporations throughout Scotland were watching with interest the experiment that Glasgow was making. In Perth, the fight with the plumbers was waged many years ago. The gas corporation won there, and there had only been occasionally a little grumbling. The argument which had been most effective against the plumbers was that the Gas Committee proposed doing things for the good of the community, and not for a limited number of traders.

Mr. JOHN RICHMOND (Penicuik) regarded the paper as one well worth taking to heart. Unfortunately, they in Scotland were far behind the times in respect of maintenance, as compared with the gas undertakings in the sister countries of England and Ireland. He was afraid they had developed a conservatism which ought to be abolished. If they considered all the points the author had detailed, it would do the industry in Scotland a vast amount of good. He could see no advance unless the antipathy of local plumbers was removed, and the prejudice or conservatism of consumers in general was broken down.

Mr. JAMES BELL (Dumbarton) said he had heard gas engineers stating pointedly and deliberately that, in their view, the lighting load was a thing of the past. This was not his belief at all; and sooner or later they in the gas industry had got to tackle this question. In his town they had very strong electrical competition. Practically all the shop lighting in Dumbarton was electric. They had, however, taken a step in the right direction, and had retained a small amount of shop lighting, by placing before their customers the best and most up-to-date methods of illumination they could procure. So far they had met with unqualified success in Dumbarton. If he was asked by a customer if it was possible to improve his light, he invariably replied in the affirmative. They tackled many of these jobs; and it was a standing advertisement to their credit that they made good with all of them. They had wrested from the Electricity Company a good many of their original lighting consumers. An engineer, some time ago, when passing through Dumbarton, remarked that he was amazed at the condition of affairs there in regard to public lighting. On hearing the observation, he (Mr. Bell) explained that this particular branch of illumination did not come within the province of the local gas engineer, but was a part of the civic work that was delegated to the burgh surveyor. This explanation exonerated him in regard to that specific complaint. Of late, however, as he had already explained, he had taken a hand in endeavouring to improve matters. A few years ago there was in Dumbarton an agitation to get the burgh to go in for some up-to-date method of public lighting. As a result, he brought the subject before the notice of the Gas Committee, and asked permission to let the public see what really could be done. The Committee allowed him to fit modern lamps and fittings in certain selected positions. Out of some 500 lamps, he was permitted to experiment with fifteen. These modern lamps were placed in the main thoroughfare, and were at once acclaimed a success. He was ready to believe that the plumbers in some districts were a stiff proposition; but he was a great believer in a little gentle persuasion. In Dumbarton, there was no doubt that during the past few years a great deal had been done to bring before the public the best ideas for heating, lighting, and cooking. The campaign had been quite successful, because, as a matter of fact, the distribution staff had been doubled to meet the demands of the consumers. Although he had no particular authority from the Town Council or any other body, he had always made a point of playing into the hands of the private traders. There was a feeling of reciprocity between the traders and the gas department, and the arrangement worked very successfully indeed.

Mr. JOHN WILSON (Motherwell) said he had been keeping his eye on the flames shown in the corner of the hall, and was bound to assert that they represented a position of matters which could only be described as "pretty awful." It simply amounted to this—that the poor old gas consumer did not know what he should get. He purchased any old burner out of an ironmonger's shop, and stuck it up. The time had arrived when the gas industry ought to bestir itself in arranging for an individual canvass of the gas consumers, with a view to showing them what could be done. The necessity for this had been proved conclusively in the course of the discussion. Makers of gas appliances had made, it would be admitted, a tremendous endeavour during the past ten years; and particularly during the past five years they had done exceptionally well. He remembered when the first incandescent burner came out; and as a burner it was infinitely superior to the type of article marketed to-day and sold by local ironmongers. The old-fashioned burner—a substantial arrangement of solid brass—was brought down at the end of the winter season, cleaned, polished, and put up again ready for another spell of duty. It was good for another year—another ten years, if necessary, for that matter. They could not do this to-day with the flimsy, gimcrack burners they saw all around them. No doubt the better types of burners cost a little more in the first instance; but the consumers would not grudge this. In point of fact, the consumers knew nothing about them until they were brought to their notice. Then there was another matter which had not emerged from the discussion. He referred to mantles. No matter how good a burner might be, if there was not a suitable mantle affixed to it the best efficiency would not be obtained. He had the feeling that something ought to be done in the way of standardizing mantles, and that a step in this direction would go a long way to retain the lighting load. He agreed with the author that they ought to go ahead with reforms in regard to maintenance. Maintenance should not be confined solely to the burner. There ought to be a universal examination and maintenance of fittings; and if this were done, not only bad burners, but bad fittings and bad connections would disappear. The number of complaints that arose in which the trouble had been traced to bad connections, was surprising. Probably it arose in the first instance through no fault of the gas department; but it nevertheless remained the fault of the gas department that they did not now see to the rectification of these things.

Colonel PEEBLES (Edinburgh) felt the only solution of the problem that had been raised was that the gas industry should have the power the electricity industry possessed—control of the size of piping to be installed in houses. Until they obtained this power, they would never be able to control their pressures and give that adequate supply which Mr. Stones showed was necessary. At the present moment, no doubt, it was a very large undertaking to go in for re-piping premises; and the only way one could get over this was by increasing the pressure in the mains. Unless, however, they could get a constant pressure, they would never obtain the highest possible efficiency. In the recent inquiry in London relative to the therm, the question of governors was brought up; and he believed the real reason why the Committee did not specifically advocate them was because of the expense. Unquestionably, it would be a very considerable expense for any undertaking to supply, along with the meter, a governor, so that every consumer would get a constant and unvarying pressure. If, however, the value of such a governor was represented to the consumer, he might be found quite willing to pay a quarterly rental for it, just in the same way as stoves and other fittings were hired out. If it was put to the consumer that he would derive some benefit from it, he would not be altogether indisposed to pay. The observations made by Mr. Stones about an adequately-governed supply were necessary, and touched upon an aspect of this question which the members of the Association ought to consider. While this was so, it seemed to him that their first and most important duty was to get authority to have a proper size of piping introduced into all premises.

[The remainder of this report, having only just come to hand, will be included in next week's issue.]

Gum and Resin Forming Constituents in Gas.—An investigation is being conducted at the Pittsburgh Experiment Station of the United States Bureau of Mines for the purpose of determining the gum-forming constituents in gas, and their relationship to the deposition of gum. Co-operative aid is being received from the United Gas Improvement Company and from the American Gas Association. The determination of the gum-forming constituents in the gas of one large city where trouble from this cause has been experienced, has practically been completed; and considerable insight into the mechanism of gum formation has been gained. A survey of meter conditions in a number of representative cities has been made, and these conditions correlated with operating procedure in those places.

Superheated Steam Tar Still.—Mr. Robert Lindsay, Superintendent of the New Bedford (Mass.) Gas Department, describes in the "Gas Age-Record" a still in which superheated steam is used entirely for the distillation of water-gas tar. This has proved very satisfactory in making a road tar for patching and penetration work, which the United States Bureau has stated is equal to the best on the market. The first still was made from a tank they had on hand; a steam coil being placed in it for the first heating of the raw water-gas tar, and driving off the lighter oils. Along the bottom of the still is a 1½-in. pipe perforated with ⅛-in. holes; the holes being placed so that steam discharges through them against the bottom of the tank shell. After the steam coil has driven off all the oil possible, steam is turned into the perforated pipe, which, in blowing-up through the tar, carries with it the heavier oils. This is continued until tests of the tar show it has reached the viscosity desired. The still is then emptied, and a new batch of raw tar put in. The steam used is at an average pressure of 130 lbs., and is superheated 100° Fahr.

THE MODERN GAS SHOWROOM.

By F. Cornelius Wheeler, of the Nautilus Fire Co., Ltd.

The need for up-to-date showrooms is becoming more and more apparent throughout the gas industry, as the importance and the increasing popularity of gas as a means of heating and lighting our homes and buildings are appreciated by all classes of the community. The day when gas was regarded as a necessary evil has long since passed. This more enlightened state of mind on the part of the public is, in a large measure, due to the great efforts made by all the leading manufacturers and gas undertakings to produce for modern requirements apparatus that is hygienic and efficient, and at the same time pleasing to the eye.

Many of the principal stove makers have taken large premises admirably equipped and decorated for the proper display of their goods. Again, many of the more important gas undertakings and other small but enterprising companies throughout the country have realized the importance of showing their goods to the best advantage in order to further the sale of gas; and in every case it is believed the expenditure involved has been more than justified. On the other hand, we can all of us call to mind many so-called gas-showrooms which would disgrace a third-rate marine dealer's store. We have all seen this soi-disant showroom, where the principal exhibits are dust, dirt, broken mantles, damaged fuel, and rusty apparatus lying about in complete confusion. At the head of this conglomerate mass of inefficiency is an elderly and sometimes rather untidy individual, whose sole qualification for the showroom would appear to be a disinclination on the part of the Board or Committee to pay this worthy a pension. A policy of this nature is not only retrograde, but is the worst possible advertisement for the uses and advantages of gas. Our enterprising friends in the electrical world form an object lesson in this respect which should not be lost sight of.

It will not come within the scope of this article to discuss the merits and advantages of gas over other forms of heating and lighting. One point, however, which is being forced almost daily on the writer is the much greater interest that has been displayed by architects, surveyors, and builders during the last year or so; and it is these three professions who are mainly responsible for the erection, reconstruction, and equipment of our homes and buildings throughout the Empire. The labour-saving properties of gas are apparent to everybody—a fact which has been clearly demonstrated by the propaganda work of the British Commercial Gas Association, who have ably brought the advantages of gas before so wide a circle.

In order to reap the advantages which have been put forward for the use of gas, the provision of modern and well-equipped showrooms is continually in the mind of a progressive engineer. An old-fashioned and ultra-conservative Board will frequently restrict his aims to the production of gas and gas only; but the finest-quality gas requires suitable apparatus in which to burn it, and therefore it would follow that the finest-quality gas and the most up-to-date apparatus in suitable surroundings must be provided to attract potential consumers.

A number of gas fires and cookers littered about the floor do nothing to popularize the use of gas-fires or the sale of gas. With the reduced cost of wages and materials, it is quite possible, in the majority of cases, to provide eminently suitable showrooms for an expediture of a few hundred pounds. Before any definite scheme of reorganization is attempted, the services of an architect with a thorough understanding and a sympathetic knowledge of the various requirements of the industry should be engaged to prepare the necessary drawings and estimates for the work.

It has been the writer's good fortune to be consulted by some of the leading gas undertakings with regard to this important branch of the industry; and it is hoped that a few remarks under the above headings, based on experience thus gained, may be of some interest at the present time.

Site and Accommodation.

The ideal situation for a gas showroom is undoubtedly in the main thoroughfare, where ample window space can be obtained for a proper and seasonable display of the various types of apparatus required to be shown. A site facing north or north-east is, perhaps, preferable—particularly when live fires can be shown in the window. A strong sunny aspect necessitates sun-blinds, a very fruitful cause of trouble. If the existing premises are unsuitable, it is far better to dispose of the property and acquire premises sufficiently convenient or adaptable for present-day requirements, with room for the expansion that will necessarily follow a live concern. The ideal position for the main showroom is a ground floor at pavement level; a basement or first-floor being useful for additional show space. But where sufficient area is available, it is much better to confine all exhibits to one floor. Goods displayed on two floors frequently waste the customer's time and patience, not to mention that of a salesman who may have to climb the stairs fifty times a day, involving possibly one hour's unproductive labour.

Direct lighting from the main shop-front windows is not altogether desirable. Live fires undoubtedly look their best when not exposed to the direct rays of the sun. Therefore, a showroom partly lighted by daylight and partly by artificial means would display all types of apparatus, including gas lighting, to the best advantage.

The main entrance to the showroom proper should be situated, where possible, in the centre of the frontage, and formed by wide double swing-doors, which, in themselves, always look inviting, and offer easy access from without and egress from within. The exterior treatment should be kept simple, yet dignified, with bold plain fascia lettering, giving the name of the undertaking only. All extraneous lettering on the windows themselves should be avoided. Simplicity and directness should form the keynote of the design.

The stall boards inside the windows should be slightly raised above the pavement level—say, 12 in. to 15 in.—and enclosed with a simple background to accord with the general decorative scheme. All attempts at forming more or less permanent model rooms are to be deprecated, as the window settings should be changed as frequently as possible. This remark would apply more particularly to the smaller towns.

General Planning.

The various types of modern apparatus call for separate treatment; and, where space permits, the showroom should have more or less definite areas allotted for the display of each type.

1.—Section for gas-fires in proper settings.
2.—Cooker section.
3.—Hot-water apparatus section.
4.—Gas lighting and fittings section.

Gas-fires are seen to the best advantage when fixed complete with mantelpiece, tile setting, hearth, and kerb. The mantel need not be expensive or elaborate. A simple setting undoubtedly gives value to the appearance of the fire. The mantelpiece and setting should, in all cases, be subsidiary to the gas-fire.

Cookers, geysers, coppers, &c., look best against a plain tile background. A good quality varnished tile paper is almost as good as real tiling for this purpose, and has the advantage of being much cheaper. The ideal setting is approached when each type of apparatus is placed amid the surroundings appertaining to that part of the house which it is destined to occupy.

Gas-fittings are, perhaps, a somewhat difficult problem, as it frequently happens that no particular space can be reserved for them. In consequence, one has seen otherwise modern showrooms marred by a forest of pendants and wall-brackets fixed to all spare ceiling and wall space.

When arrangements of display are decided upon, it is of the utmost importance that all consumers and inquirers should have to pass down the length of the showroom before their wants can be attended to at the counters or tables set apart for this purpose. Customers will not be bored, even if they are kept waiting for a few minutes, if there is sufficient to interest them in the showroom. A heterogeneous mass of ill-placed apparatus will stimulate little interest, while a few well-placed articles cannot fail to attract attention. A table centrally situated, bearing magazines and papers, with literature relating to gas apparatus, will enable a few minutes to be agreeably passed until a salesman or clerk is at liberty to attend to a consumer's wants.

Decorative Treatment.

The decorative treatment to be adopted in modern gas showrooms depends almost entirely on the amount of money that can be set aside for the purpose. If first cost is not an essential consideration, a well-planned scheme of hard-wood panelling—such as oak, mahogany, or walnut—is probably the most economical in the long run. Panelling in itself is charming, and forms an ideal background for the display of apparatus. Hard-wood panelling is easily kept clean, and will last, in ordinary conditions, for several hundred years—being practically imperishable, and unaffected by climatic conditions. Again, it does not deteriorate, but, on the contrary, probably appreciates in value; and if erected in sections, it can be taken down and refixed, so as to suit the varying conditions which must invariably arise.

The cheaper forms of decoration—such as paint, paper, or other plastic media—require renewal every few years, so that at the end of (say) 21 years the showroom will probably have been redecorated on three or four occasions, and there is nothing to show for the money spent; whereas had panelling been adopted in the first instance, the capital outlay would have totalled to the same sum, but the decorative value would still be there, greatly improved and mellowed by time. Another argument may, perhaps, be logically advanced. The cost of panelling may be allocated to capital account, while the ordinary treatments, owing to their perishable nature, can only be placed to current account. Panelling would therefore come within the category of furniture and permanent fixtures and fittings.

It has been learned, as a result of actual experiment, that ordinary white-lead paint and enamel should be avoided in the showroom where gas is burnt continually. A paint formed with a basis of oxide of zinc has been found much more permanent and less liable to discoloration than a paint made-up with ordinary white lead.

There is no doubt that oak batten or parquet flooring is the most suitable, and in the long run most economical for a gas show-

room. A few rugs of pleasing colour add a decorative note to the room; and cleansing and sweeping are thus reduced to a minimum. Marble paving, mosaic and terrazo, or doloment flooring, may be used with advantage in the cooker and hot-water apparatus departments. A square, red tile lino, underlined with felt,

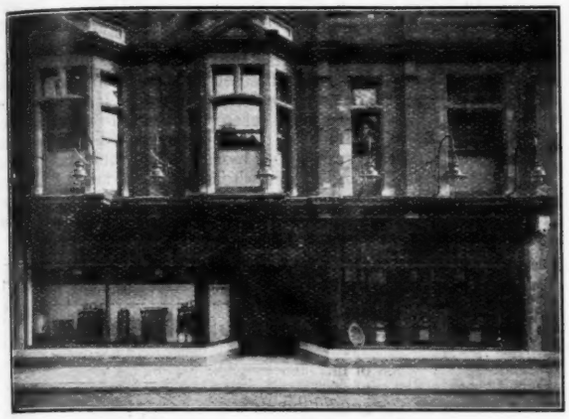


Fig. 1.—Frontage to new Showroom—Rochester Gas Company.

also forms a clean and durable floor covering, and is pleasing to walk upon, and quieter to the tread than the harder materials.

VENTILATION AND HEATING.

I purposely place the subject of ventilation before that of heating, as the majority of gas showrooms are more than sufficiently heated, while the ventilation has been treated with little or no consideration. One has frequently come across showrooms where the pervading odour is gas. Any trace of gas or stuffiness in the showroom can be but detrimental to the industry. Therefore, all traces of gas should be rigidly guarded against; and to effect this the air must be constantly changed either by natural or artificial means. The writer recently visited a well-known gas showroom in the London area where the air is washed

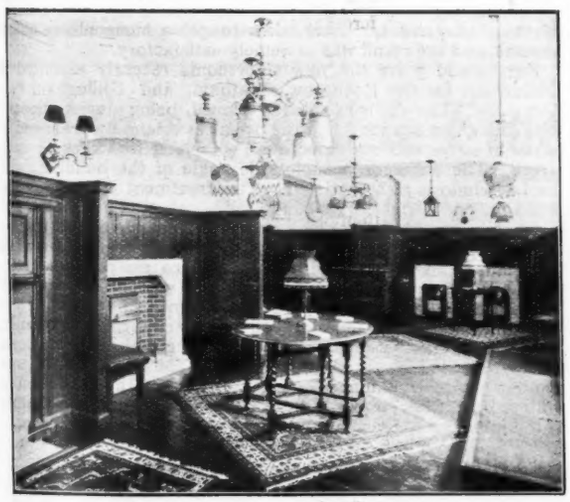


Fig. 2.—Interior Gas-Fire Section of Rochester, Chatham, and Gillingham Gas Company.

and purified before being pumped into the showrooms, and is changed at regular intervals per hour. This system is undoubtedly the ideal one; but the question of prime cost will rule it out in the majority of cases.

A simple system which has been found satisfactory and economical is as follows: All live gas-fires should be taken into auto-vent cast-concrete flues, which not only remove the products of combustion, but in themselves greatly assist the changing of the air by the ventilation flue incorporated with the flue carrying off the products of combustion. Air-bricks should be built into the external face of the brickwork under the stall-boards, controlled with regulating shutters on the inner face of the wall, in order that as much cool fresh air as possible from the outside may be drawn in just above the floor level. The glazing to the shop fronts should, where possible, be divided with a horizontal transome having ventilating lights hung on centres, fixed as near the ceiling level as possible, in order that the vitiated air collecting at ceiling-level may be discharged to the open air.

The writer was recently called in to inspect a small showroom which had been designed and executed by a local builder. The builder—no doubt an excellent man in his own particular line of business, but obviously possessing little knowledge of the requirements of a gas showroom—had failed badly in almost all the essential features. In the first place, no provision had been made for live fires, as the only live flue in the room to which a fire could be fixed had been carefully bricked-up. Also, no attempt had been made to consider the question of ventilation, though careful provision had been made for some two dozen gas-points for the display of live gas-fittings. Shallow stallboards about 2 ft. from the glass line had been placed about 3 ft. 6 in. above the pavement level.

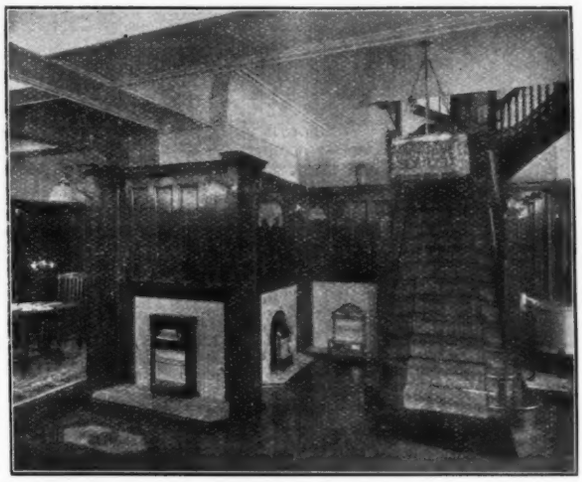


Fig. 3.—Staircase and Showroom—Redhill Gas Company.

At this stage the writer was called in to report and advise as to the best methods of fitting-up the new showroom. On arrival at the main front of the new showroom, no entrance was visible. This was found to be down a side passage—the first evidence of bad planning. On entry, the most conspicuous object in the room was a spacious fitment occupying the principal wall space, and destined to contain a large meter, perhaps the one piece of gas apparatus which it is unnecessary to bring prominently to a customer's notice. This incubator of therms now occupies a less obtrusive setting.

After a brief survey, the following recommendations were made:

1.—Open up the live flue to receive a modern gas-fire with complete mantelpiece and tiles, hearth, &c.
2.—Build-up an auto-vent cast-concrete gas-flue on the opposite wall, in order to demonstrate a modern built-in gas-fire suitable for local housing requirements, and further to improve the ventilation.

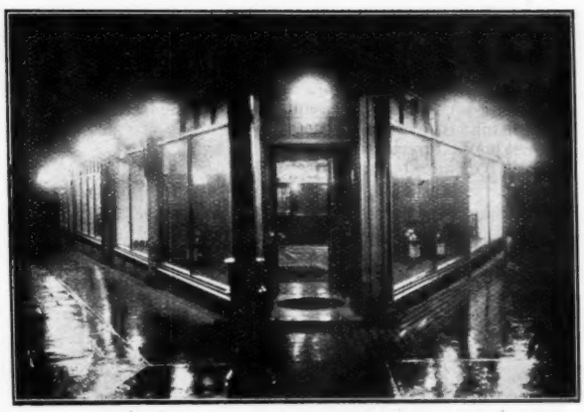


Fig. 4.—Exterior by night of new Showroom at Gillingham for the Rochester Gas Company.

3.—Reduce the height and increase the depth of the stall-boards, in order that the display of the apparatus could be properly viewed from outside.
4.—Cut away the brickwork under the stall-boards, and provide for the intake of fresh air from the roadway; and fix hit-and-miss regulators on the inside.
5.—Remove the plate glass from the windows, and alter the frames to receive transomes fitted with ventilating sashes at ceiling-level to remove the foul air.

The expense involved in making these vital alterations could have been obviated had the advice of an architect been invited before the work was put in hand. The case cited may be an

extreme one; but it is typical of the many pitfalls which beset the unwary.

The subject of heating a gas showroom is one which needs little consideration. If sufficient live flues can be provided (and this is an extremely easy matter with concrete gas-flues), gas-fires placed in various parts of the showrooms will furnish all the heat necessary, and at the same time provide the most attractive display.

Fig. 5.—Interior of the New Rochester Showroom.

In certain circumstances, it may be necessary to have a few low-temperature hot-water radiators, which can be run from a small coke-fired boiler placed in a tiled recess, and working in conjunction with a high-grade gas-cooker. The combination of a gas-cooker and a coke-boiler for the supply of domestic hot water, and possibly one or two small radiators, is popular because of the ever-present economic factor.

The present-day problem of the most advantageous means of the disposal of coke suggests that space should be reserved for showing a few of the many highly efficient and economical coke-stoves, which are becoming increasingly popular in this country. Gas-radiators can often be usefully disposed on landings or staircases, but one would hesitate to recommend them as a primary means of warming the room.

Representative Showroom Schemes.

In conclusion, it may be of interest briefly to describe the photographs of a few representative showroom schemes which it is hoped may illustrate some of the principles suggested in the earlier part of this article.

Fig. 1 is the new showroom opened-up by the Rochester, Chatham, and Gillingham Gas Company at Rochester. Before the alterations, the only show windows were small circular-headed windows of the ordinary domestic variety, fitted with stall-boards some 2 ft. 6 in. above the pavement level. The whole of the front below the fascia level was cut away, and the main facade of the building carried on stanchions and girders; the two stanchions being cased-up in the angle mullions on each side of the central entrance, thus ensuring an unimpeded view of the apparatus in the flanking windows. The fresh-air inlets may be seen just under the stone sills below the glass. The high-pressure gas-lamps are a noticeable feature just above the fascia.

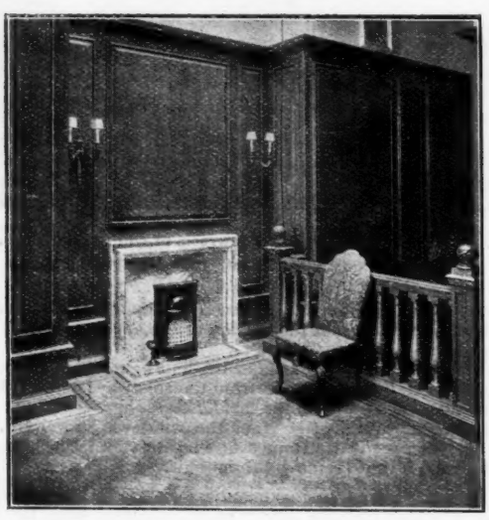
Fig. 2 gives an interior view of the gas-fire section of the showroom, where fires are displayed in simple and natural surroundings. The general decorative treatment is simple and inexpensive; oak only being used for the panelling to the window enclosures and the inglenook in the foreground. The remainder of the walls are treated with open stained and polished deal stiles and rails, and the panel space filled with a leather paper representing cow-hide, lined round with a stud border. The portion of the wall spaces over the panelling is painted a soft cream colour, finishing with an enriched fibrous plaster cornice.

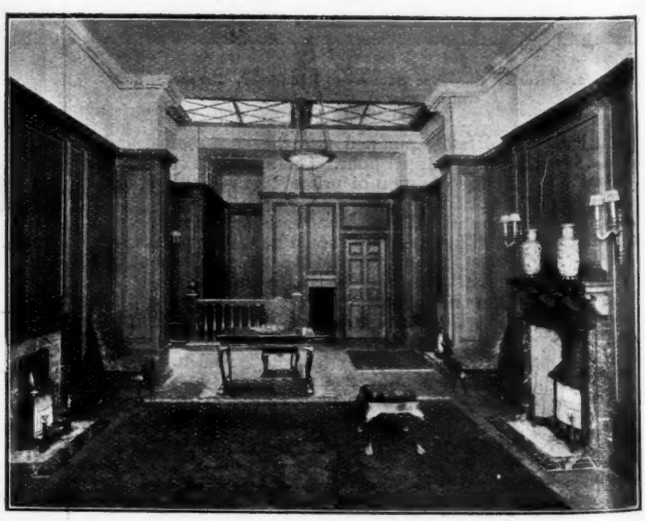
Fig. 3 illustrates the staircase and one end of a showroom designed and carried out for the Redhill Gas Company. Oak, again, is the material selected for the panelling. Here it may be noted that mantelpieces have been eliminated from all fire-settings. A simple opening in the panelling filled-in with tiled slabs (made interchangeable), and loose tiles for hearths finished with a simple oak curb, gives the whole display a restful air, and at the same time affords greater prominence to the object displayed—viz., the grate itself. The tiled backs vary in every instance; but great care was taken to get a harmonious colour scheme, and the result was extremely satisfactory.

Fig. 6.—Messrs. John Wright's London Showroom before Alteration.

Figs. 4 and 5 are the new showrooms recently executed at Gillingham for the Rochester, Chatham, and Gillingham Gas Company. The site is excellently placed, being almost opposite the Gillingham Station; and the premises originally consisted of a pair of shops and one floor over, with long frontages to each street. The entrance occupies the angle of the building, with display windows right and left. The treatment of the window enclosure to the right of the entrance is oak, wax polished a rich shade of brown, thus forming a good background for the display of gas-fires. The window space adjoining is framed in white panelling, a most effective setting for modern gas-cookers.

Fig. 5 shows a heavily-beamed opening where the party wall between the two shops was cut away to throw the two shops into one showroom. At the far end will be observed the pay counter. Thus all consumers must traverse the length of the showroom before their wants can be attended to. The display of a large number of fires, which can be used for heating the showroom in winter and for demonstration purposes, has been made possible by the judicious use of the "Nautilus" auto-vent concrete flues.





Figs. 7 and 8.—Views of Messrs. John Wright's Showroom after Reconstruction.

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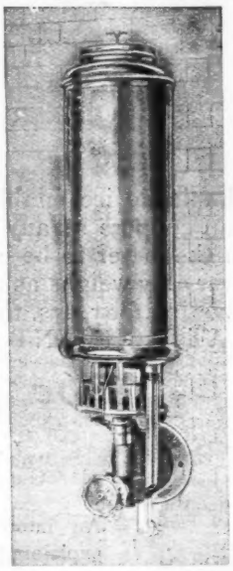

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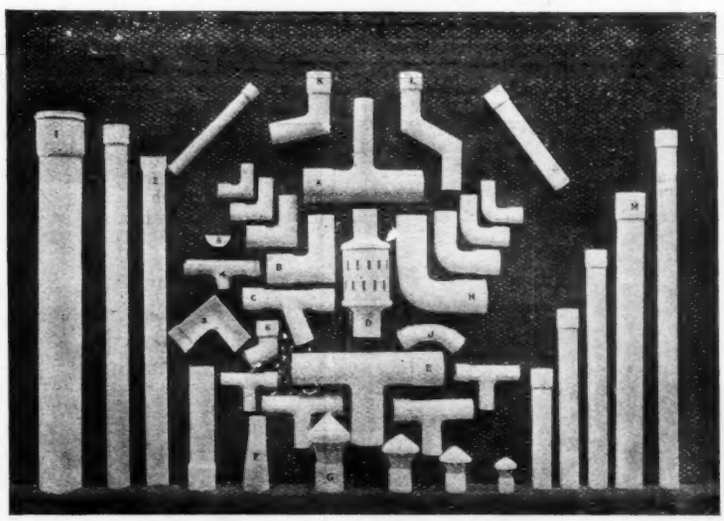

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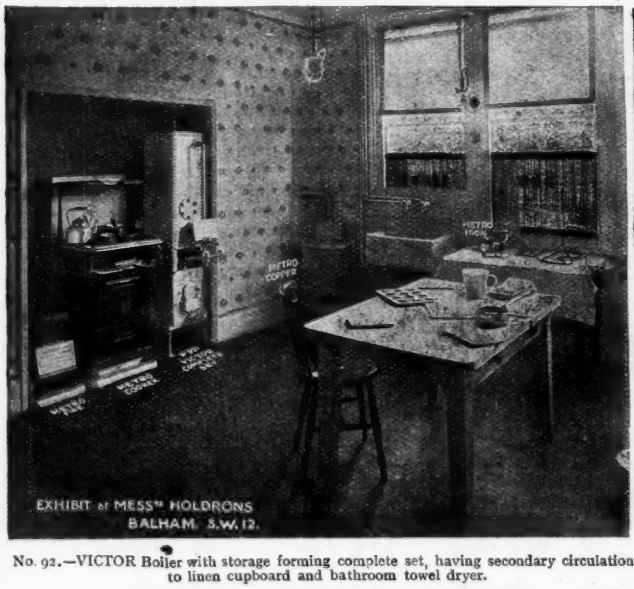
Two examples of their convenient application are here given, showing "H" Series Boilers installed for the Exhibit of Hot Water Circulating Apparatus in the **"Easy-to-work" Flats, inaugurated by the South Metropolitan Gas Company** in the principal shopping centres of their area.



No. 92.—VICTOR Boiler with storage forming complete set, having secondary circulation to linen cupboard and bathroom towel dryer.

No. 92.—VICTOR Boiler with storage in hot linen cupboard adjoining and secondary circulation to bathroom.

CATALOGUE AND ADVICE UPON ALL MATTERS RELATIVE TO HOT WATER INSTALLATIONS, GRATIS.

THOMAS POTTERTON, HEATING ENGINEER, Ravenswood Rd., Balham, London, S.W. 12

The photograph of the exterior at night shows very clearly the advertising value of high pressure gas lighting. The installation consists of fourteen 6-light "Littleton" lamps. These are, in the ordinary way, lighted and extinguished by a distant-control device; but in this case a clockwork arrangement manufactured by the Horstmann Gear Company is fixed at the main supply to the lamps, so that when the exterior of the premises is left illuminated, after the assistants have finished business for the day, the

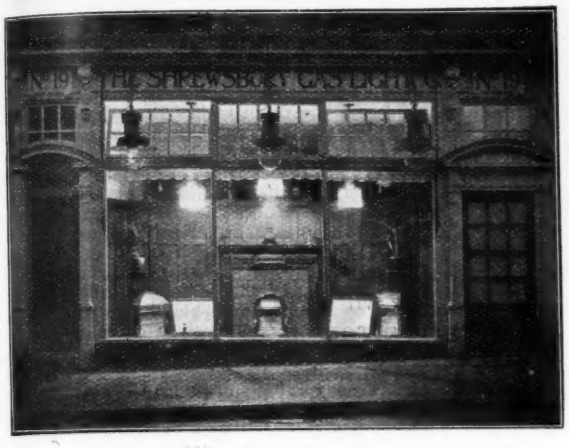


Fig. 9.—New Front—Shrewsbury Gas Company.

supply of gas is cut off automatically at any hour desired. This system has been in use all the winter months, and has proved itself excellent in every way.

Fig. 6 shows better than words could indicate how out-of-date premises can be transformed into a modern up-to-date show-room. In this instance the shop front was unaltered, with the exception of a new fascia and the complete obliteration of all extraneous lettering which formerly adorned the window.

The illustration gives a good impression of how the interior was formerly arranged; and the photographs Nos. 7 & 8 represent the showrooms after the alterations. An air of simple and refined dignity is obtained by covering the wall spaces to a height of 10 ft. 6 in. with Austrian oak wainscot, having the raised and bevelled panels framed into carefully detailed bolection mouldings made famous by Sir Christopher Wren. The plaster cornice is a faithful reproduction of the famous Grinling Gibbon cornices designed by Wren for the state apartments of William and Mary at Hampton Court Palace. This fine room only contains seven fire-settings; but the bold, yet simple, surrounds in various marbles from the Pyrenees display the fires to the greatest possible advantage, as can be more clearly seen in fig. 7, where light and dark shades of Breche Violette marble have been used.

Fig. 10.—Interior View—Shrewsbury Gas Company.

The floor is laid with ¼-in. herring-bone oak parquet with simple two-line border in walnut, upon which choice Bokhara rugs give a pleasing note of warmth and colour to the room.

Figs. 9 and 10 furnish a good indication of the results achieved by a progressive policy in a small Cathedral town. These premises at Shrewsbury were hopelessly out-of-date before the reconstruction, and the judicious expenditure of a few hundred pounds on a scheme carried out by local labour, under supervision of an expert, is a good example of what can be achieved for a nominal outlay. Fig. 11 gives an idea of the showroom before reconstruction.

The exterior is painted a pale cream finished in flat enamel, which is easily washed-down from time to time; and the fascia

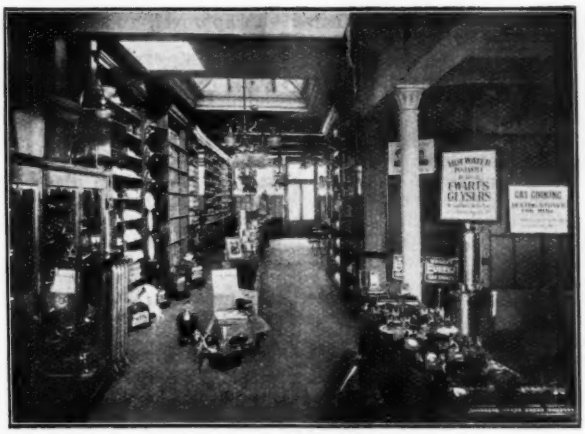


Fig. 11.—Same Showroom before Reconstruction.

lettering in dull black gives an air of restraint in keeping with the dignity of a gas undertaking. The oak-panelled enclosure, visible through the plate glass, is made in sections, and can be taken down in a few minutes when the nature of the display necessitates its removal. A general view of the interior suggests a sense of restraint and suitability for the purpose intended, and exemplifies further the extremely good effect that can be obtained at a minimum of expense.

In the space of a short article, it is only possible to dwell very briefly on the many and varied problems arising out of a showroom scheme; but it is hoped that the importance of the subject may justify the Editor in kindly allowing me so much valuable space in his paper.

The schemes illustrated above were designed and carried out by the Nautilus Fire Company, of No. 60, Oxford Street, W. 1.

THE STUDY OF DAYLIGHT ILLUMINATION.

At a meeting of the Illuminating Engineering Society on March 27, a paper on "Window Design and the Measurement and Predetermination of Daylight Illumination" was read by Messrs. P. J. and J. M. Waldram.

A special invitation was conveyed to members of the Royal Institute of British Architects and the Surveyors' Institute to take part in the consideration of the subject, which was naturally of great interest to members of the architectural profession. At the same time, those concerned with artificial lighting can learn much from the study of daylight. Illuminating engineers have been led to consider natural lighting because our impressions of daylight are largely responsible for our views on correct methods of artificial illumination.

The paper contained a very comprehensive survey of work that has been done in this field during recent years, notably by the Joint Committee of the Illuminating Engineering Society on the Natural Lighting of Schoolrooms. Investigations have also been proceeding for some time at the National Physical Laboratory; and Mr. J. W. T. Walsh, who opened the discussion, referred briefly to this work, and congratulated the authors on the value of the paper. Few people who criticize artificial lighting on the ground of lack of uniformity have any idea of the enormous variations that occur in daylight, not only at different periods of the year, but in the course of a single day. The authors presented a series of diagrams illustrating this, and also pointed out the great diminution in light that occurs in the average room as one recedes from the window. An important point is the greater value of the upper portion of the window, as the rays from the lower region of the glass do not penetrate to the back of the room. This was illustrated by an ingenious model.

The photometry of daylight has now become a special problem which has many interesting features. In view of the variability of daylight, absolute measurements at a given moment do not help us very much; but relative measurements, connecting the internal illumination at any moment with the total unrestricted daylight out of doors, are extremely valuable. Thus it was suggested that the "grumble point"—*i.e.*, the point when persons begin to complain of the light—is reached when a worker only receives 0·2 p.ct. of the total outdoor illumination. The comparative measurement may be made in two ways—either by determining the illumination derived by full daylight at the window-sill, or by deducing the full unrestricted daylight illumination from an observation of the brightness of the sky. Both methods have advantages; but it was remarked by Mr. Walsh that one cannot in practice always get a free view of the sky.

From the measurement of daylight to the prediction of daylight conditions in a building yet to be erected is a big step; and the methods by which this can be done appear somewhat complex, though they will doubtless be standardized in course of time. The authors presented a simplified formula for use in this con-

nection, which Mr. Walsh noted with approval, and had found substantially accurate.

Mr. D. R. Wilson, of the Home Office Factory Department, who presided, emphasized the great importance of the study of daylight illumination in connection with industrial work; and Mr. L. Gaster referred to the use of scientific measurements in connection with "ancient light" cases which had recently received important recognition.

It was announced that the next meeting would take place on April 24, when a discussion on "The Lighting of Printing Works" (compositors' benches, machining, proof-reading, and editorial departments, &c.) would be opened by Mr. Gaster.

BOYS' CALORIMETER.

"IMPROVEMENTS IN MEANS FOR MEASURING AND DELIVERING GAS AT A KNOWN RATE."

[Extract from a Patent Specification filed by the Board of Trade and Prof. C. V. Boys, F.R.S.—No. 194,370.]

This invention relates to the measuring and delivering of gas at a known rate, and has for its object to provide improvements in or modification of the invention of Patent No. 180,080. [See "Journal," Vol. CLVIII., p. 680.]

In recording gas calorimeters the most difficult problem has been the automatic correction for the varying volume of a definite quantity of gas in consequence of the effect of temperature and pressure on its own volume and the effect of these on the proportion of contained water vapour and hence of its total volume. What is required is that the gas should be measured and delivered at such a rate (whatever the temperature and pressure may be at the moment) that if it were thereafter brought to standard temperature and pressure and were still saturated with water vapour and measured in that condition, the rate of flow so measured should be constant. Further, it is important that the measurement and delivery should be performed with the highest possible degree of accuracy, if possible in excess of that hitherto customary in the use of meters used in gas testing.

The patentees point out that in Patent No. 180,080 there was shown as a part of a complete recording calorimeter one way of solving this problem. They have, however, since making that application invented a more perfect way of solving the problem, which in particular attains the high level of accuracy desired; and this is the object of the present invention. In Patent No. 180,080 was described a method of mounting a meter drum loose on a screw-threaded clock-driven axle turning at a known and constant rate, whereby it automatically governed the flow of gas to the rate determined by a water level which was made variable, so as, with a special form of drum, to correct for variations of temperature, pressure, and consequent changes in the proportion of water vapour. According to the present invention the water level is maintained constant, so that any form of drum may be used and the same actual volume of gas is allowed to pass for each revolution of the drum; but the rate of rotation of the axle is made variable so as to pass gas in such volume as to correspond to its volume at the temperature and pressure of the moment.

In this specification the patentees continue to effect rotation of the meter axle positively by the clock and intermediate toothed gearing, but use a bell-actuated integrator to make the necessary slight variation in the speed of the clock-driven axle, either increasing it or diminishing it (as the volume of an enclosed sample of gas saturated with water vapour is greater or less than its volume at standard temperature and pressure in proportion to such change) by the use of epicyclic gearing. Since the greatest change of rate from the normal likely to be required is about 10 p.ct. either way, a gearing-down of integrated motion of 10 to 1 or thereabouts, as compared with the gearing from the clock to the meter axle, is incorporated with the epicyclic gear.

It has been found that leakage of water along the prolonged axle of the meter made according to the previous patent is easily prevented completely by lubricating it with a material such as vaseline—most conveniently applied through a screw-actuated lubricator—and that there need be no leakage of water at the joint made by a glass bell with a ground edge like the bell of an air pump resting on vaseline or thick grease on the metal rim of the meter casing below the water level. If, then, evaporation of water is prevented, the water level set so as to give the right capacity to the meter will be maintained for a long time. Accordingly, the capillary water-feed and escape are no longer employed; but vaseline or similar material is used to seal the axle and sleeve and joint between the transparent cover and casing, and the gas is passed, before it enters the meter, through a saturator near the meter so that it may pick up all the water vapour that it can carry or deposit excess.

In order that any very small variation of water level may be detected, a series of points is arranged nearly at the same level at about the water level within the meter, which points may be set so that some only break the surface or completely disappear during the working of the meter as seen by an oblique view above the water and through the transparent cover. This enables far more precise observation than is possible by the usual setting by a line. Further, in order that any very small change of level may have as little effect as possible on the gas-passing capacity of the drum, the usual form of four-part drum is used instead of the special form of drum which was specially designed to produce a considerable but definite change of gas-passing capacity with change of water level. By the form of drum adopted, variation of water level affects the capacity of the measuring quadrant, at the moment when the gas is tapped within it, to a smaller degree than it does in the ordinary four-part drum, but still sufficiently to allow of water adjustment for capacity. The number of compartments is not limited to four; but four is the most convenient. The patentees specify a hollow box with an axial tube; the box being of such size in cross-section as to extend above the water level in any compartment at the moment of tapping the gas, and of such length as to leave a moderate space between one end and one of the discs (which are preferred for the sides of the drum rather than the usual four aprons). Then, when the meter is working, the water can pass from one compartment to another across the central space at the free end of the box. This box has the further advantages that it connects and makes rigid the radial partitions, thus ensuring that the capacity of each compartment of the drum may remain definite—*i.e.*, unvarying during operations. Further, it may be made by its buoyancy just to support the weight of the drum and so make the friction between the drum and axle less.

While a drum loose on a screw-threaded power-driven axle is free from interference by axle friction (which is overcome by the clock or other power), the gas pressure has to overcome the resistance caused by turning the drum in the water and also that caused by the necessity of driving water from one compartment to another. A larger drum turning more slowly so as to pass the same quantity of gas, meets with less obstruction from both these causes. Now, since any resistance overcome by the gas pressure causes the water level in the mantle and the compartment receiving gas to be lowered, though even to a trifling extent, such lowering increases the gas capacity of the quadrant at the moment of tapping the gas, and thus causes a slight increase of flow of gas; and a large drum is much less affected, and is preferred in order to obtain the greatest possible accuracy of measurement. The drum in the example given later in the specification has six times the capacity of a drum which would turn once for each turn of the water-wheel or of the escapement wheel of the clock. In order to use the larger drum, the axle must be geared-down from the clock in the proper ratio.

There follows a detailed description of a particular example of the invention, fully illustrated; but the foregoing must suffice to indicate the progress of this calorimeter. The claims will be included in our "Register of Patents" next week.

The Unprofitable Consumer.

The Michigan Public Utilities Commission, wishing to consider the question of gas rates in connection with small consumers, asked the Grand Rapids Gas Light Company for a report. This has since been prepared, and includes an analysis, compiled under the supervision of the Secretary (Mr. G. R. Chamberlain), of 454,315 gas bills presented during the year ended Oct. 31, 1922. It seems that 4861 meters, or 1·07 p.ct. of those read, showed no consumption at all. Two-thirds of the gas was used by 90 p.ct. of the consumers; while one-third was consumed by the other 10 p.ct. According to Mr. W. F. Douthirt, in the "Gas Age-Record," the consumers taking 700 c.ft. per month and under had a total of 44,427 bills, or 9·78 p.ct. of all rendered during the year, though they recorded only 1·38 p.ct. of the gas sold. In the group of 900 c.ft. and under, 13·66 p.ct. of the consumers used about 2·5 p.ct. of the gas sold. The group of 1000 c.ft. and under per month indicated that 16 p.ct. of the consumers took about 3·5 p.ct. of the gas sold. The Company, in their report, state that they, like every other gas company, carry a very large group of consumers whose accounts do not pay operating expenses; and also another big group whose accounts, while paying operating expenses, fall short of providing a proper return. This state of affairs is the result of the long-established, but economically faulty, flat or uniform rate per 1000 c.ft.; and "it results in a higher rate to that group of consumers whose business is profitable than they ought fairly to pay." The group whose accounts do not pay operating expenses comprise roughly one-third of all the consumers; while those whose accounts, while paying operating expenses, fall short of a proper profit, approximate to about one-third of the total number of consumers. By calculation, it appears that the consumer whose bill amounts to $2·28 per month exactly pays the expense he causes, but does not provide any profit at all. Those whose bills amount to less than the figure named are, of course, carried at an absolute operating loss. In other words, all consumers—about one-third of the whole—taking less than 1700 c.ft. per month constitute an absolute loss to the undertaking. Another one-third of the consumers (those using from 1700 to 2700 c.ft. per month) pay operating expenses, and contribute about one-half of what they ought towards profit. The 2800 c.ft. group just about pay their way, including profit. The remaining one-third of the consumers (those taking 2900 c.ft. or more per month) make up the operating loss caused by the first one-third and contribute their profit, as well as about one-half of the profit the second one-third should contribute. This profitable one-third part use about 60 p.ct. of all the gas sold. The Commission will consider "the form the rates should take in order to get from the small users of gas the amount that ought to be gotten from them in justice to the other users."

FERRO-CONCRETE AND ITS APPLICATIONS TO GAS-WORKS CONSTRUCTION.

By J. TWIST, of the Swansea Gas Light Company.

[A Paper read before the Wales and Monmouthshire Junior Gas Association, March 24.]

The aim of the engineer in the gas industry to-day is, or should be, to produce the maximum quantity of gas with the least possible amount of waste expenditure. Money is very easily wasted; and the modern gas engineer, when called upon to erect a new works or to make additions to existing works, has to consider and explore many schemes with the view of obtaining plant and constructions which will not only be economical in their first cost, but will also be economical in labour costs, running and maintenance charges.

In the case of new works, built out of capital, the initial cost has a direct bearing upon the cost of gas to the consumers at least for a period; but the heaviest charges which the gas engineer has to face, and for which the consumer ultimately has to pay, are undoubtedly renewal and maintenance costs. The conscientious engineer is always watching his chance to reduce these charges; and in these days, if he studies the materials available for constructional purposes, he is certain to be impressed by the possibilities which ferro-concrete offers of reducing these charges, together with initial costs, to a minimum. During the past few years I have had occasion to visit a number of works in different parts of the country, and I am pleased to say that gas engineers have been quick to realize the value of reinforced concrete.

The engineer is constantly battling with force. No matter what his denomination, he is either endeavouring to harness a force with the object of turning it into useful work, or he is fighting to prevent a force from doing something contrary to his purpose. Now a force, for the purpose of this paper, may be said to act in two ways. Either it pushes or it pulls. The engineer speaks of the action of a force as stress. If the force exerts a push and meets with resistance, it tends to compress the object upon which it acts. The engineer calculates such action as compressive stress. If, on the other hand, the force exerts a pull upon an object, then he says its tendency is to put the object into tension, and he calculates the action as tensile stress. Now given the force acting upon a body or object, whether it be compressive or tensile, the engineer can deal effectively with it. According to the material in which he is specially interested, he can resist the action of the force or he can transmit it from one point to another. Some materials are particularly useful by reason of the resistance they offer to the compressive action of a force; others, again, are particularly good for their ability to resist the tensile action of a force. In past days engineers used cast iron, timber, or masonry to resist the compressive action of forces with which they had to deal; but these mediums were of little use in resisting tensile action unless the forces were small. It was, therefore, necessary to use another medium for this purpose. This medium was iron, and later steel. The obvious disadvantage of these materials is that if exposed to the atmosphere they are liable to corrosion or deterioration, and require constant care. Corrosion and deterioration allow the force gradually to overcome the resistance which the engineer originally provided; and given sufficient length of time the force will bring about the collapse of the medium of resistance. The use of these materials in the acid-laden atmosphere of a gas-works means constant care, supervision, and labour, and I think one may truthfully say that such labour and supervision is so much time and money wasted, provided a medium is available which will do away with the necessity for such care and attention. Further, this time and money, which in ordinary works language is maintenance, is a charge upon the industry. It directly affects the price of gas, and from the consumers' and engineers' points of view it is desirable that they should be eliminated. Modern concrete is a medium admirably adapted to remove some at least of the maintenance charges which the gas industry has had to bear in the past.

Previous to the advent of modern concrete, very little attention was paid to its manufacture. The engineer used it in some cases; but he had very little data to work upon. Little attention was paid either to the quality of the cement, to the quality or size of the aggregate, to the quality or cleanliness of the sand and water, or to the proportions in which these ingredients should be mixed. The cement was mixed with any available aggregate—broken brick and retort material, old stone—and the nearest available sand and water often were mixed together in unsuitable proportion to form a foundation. "Ah," you reply, "the works are still standing." True, some stand to-day—but at what cost! The materials involved were probably four or five times what would be required to-day to sustain the same loads. It is usual, when designing, to allow a margin of safety, that mysterious factor which awes the layman. Some old works buildings and foundations must have a margin of safety of twenty, or even more, when a factor of safety of five is sufficient. I call to mind a case in point. A friend of mine had occasion to calculate the strength of the steel principals which carried the roof of an old retort-house, and was surprised to find, after making reasonable assumption for loss due to deterioration, that the factor of safety was at that time fifteen; and it is safe to assume that at the time it was erected the factor of safety approached twenty. Except in very special cases, a factor of safety of five or six is ample.

In modern times the resources of science have been brought to bear upon the question of the mixing of concrete; and as the result of tests and experiment surprising information has been obtained. Cement has been, and is still being, improved. The size and quality of stone or chippings have been found to affect materially the strength of the concrete. Tests have decided that sand and other ingredients should be perfectly clear. It is necessary to take precautions to ensure that good water only is used. You may be surprised to learn that if water is considered fit for human consumption it does not follow that it is suitable for concrete manufacture; and some contractors go to the length of analyzing town water before they attempt to use it. You will therefore realize that concrete to-day is a very different medium from that of thirty, or even twenty, years ago. To all intents and purposes it is everlasting; it will withstand tremendous heat; requires no painting; and except in a certain case which I shall discuss later it requires no renewal or maintenance. Mixed in the right proportions, it will successfully resist acids. It can be moulded to almost any conceivable form, and altogether forms a very useful material. Its ability to withstand both compressive and tensile stress has been very much improved. Good as it is by itself, it is not good enough to transmit or withstand the action of tensile forces and at the same time compete in initial cost with steel for the same purposes. With the advent of modern concrete the possibility of embedding steel to resist the tensile forces became apparent. The compressive resistance of concrete is about ten times its tensile resistance; while steel has about the same strength in tension and compression. Volume for volume, steel will probably cost about fifty times as much as concrete. For the same area, steel will support in compression about thirty times more load than concrete, and about three hundred times the load in tension. Therefore, for compression only, concrete will carry a given load at six-tenths of the cost required to support it with steel. On the other hand, to withstand a tensile stress concrete would cost about six times as much as steel. If a structure or a foundation, or the members in a structure, are so designed that all the compression is resisted by concrete and all the tension is resisted by steel, each material will be serving the purpose for which it is cheapest and best adapted. Therefore, speaking generally, if designs are economical, the initial cost of reinforced-concrete structures, bulk for bulk, is less than for steel. That statement covers only the materials, and it has to be admitted that some structures are difficult to execute in ferro-concrete, and the extra time and labour involved in erection does not show to its advantage in initial cost. Take for example a bunker, hopper, or a telpher trestle. The materials in steel would probably cost more than ferro-concrete if the designs were economical; but the facility with which the steel would be erected would probably more than discount this. In these cases one has to look further ahead for the advantage of using reinforced concrete; and on comparing maintenance charges over a given period, it would probably be found that, even in the cases mentioned, reinforced concrete would be the economical proposition.

Ferro-concrete is a material which is likely to be of special use in gas-works construction; and we proceed to the title of this paper and consider how the gas engineer can use it to assist him in effecting the economies which will enable him to market his products at a reasonable price. Probably the most successful application of ferro-concrete for gas-works construction has been in connection with foundation work. A gas-works is usually situated at or near the lowest point of the district it has to serve. It is unfortunate that the lowest point of an area is usually the sump for the high ground round it, and water is more often than not one of the troubles of the gas engineer during the construction of his works. Again, the strata or the layers of the several materials of which the earth's crust consists are usually much disturbed at the lowest points. Thirty years ago the gas engineer would excavate for his foundations to strata which appeared able to carry a fair amount of load. He usually looked for hard clay or gravel; he was a lucky man if he found rock. If he were fortunate, he found good bearing ground near the surface; but more often than not he had to go down many feet before he found a stratum good enough to build on. Into his excavation he would fill what is known as mass concrete. I have heard of foundations under retort settings which consist of mass concrete to a depth of seventeen feet at some points, and I daresay that even this has been exceeded. Piles were sometimes used; timber being the cheapest material for the purpose. Timber was fairly satisfactory except that it was liable to decay in certain circumstances, and also, except in the case of one or two rare and costly timbers, it was not immune from attack by insects. After driving a pile, one could never feel sure that the driving had not shaken it at some point below the surface. But concrete, reinforced with steel, provides a medium eminently suitable for use in the form of pile. The steel is completely protected against corrosion, and the concrete, if composed of proper ingredients in proper proportions, is practically imperishable. Ferro-concrete is therefore capable of useful application by the gas engineer when he has to carry heavy loads upon bad ground. Modern gas-works plant throw very heavy loads; this being particularly the case with vertical retort installations, where loads of anything from 150 to 250 tons are transmitted from the settings to the ground by a single column or pier. To construct a foundation

which will safely sustain such loads upon bad ground is a problem that can only be economically solved by using ferro-concrete. The modern gas engineer, therefore, piles the ground beneath such loads, using ferro-concrete piles driven until a set is obtained which will allow the pile to carry the load with a suitable factor of safety. As an alternative he may spread the load over the ground by using a ferro-concrete raft.

In modern plant—and I have in mind particularly carbonizing plant—there is usually a large amount of machinery. Retort-houses are built containing two or more benches, all served by the same coal-handling machinery, and in the case of horizontal retorts by the same charging and discharging machines. If subsidence occurs of one portion relative to another, conveyors are liable to be disturbed, mains thrown out of truth, seals affected, and in other ways the work in the retort-house may be retarded. Ferro-concrete is of valuable assistance to the engineer in preventing local subsidence. He constructs above each pile or group of piles a ferro-concrete cap, the steel of the pile being firmly embedded in the caps, and connects these caps to each other by means of ferro-concrete beams, so that in the event of a pile sinking—and if carefully driven this is a very remote possibility—the load is transmitted to adjacent piles, and a greater resistance is offered to subsidence. Over the beams and pile caps he lays a ferro-concrete slab or mat, which very seldom is thicker than 12 in.; and on this he builds his plant. This is the procedure when the ground is very bad. It forms the safest foundation. The piles, the caps, the beams, and the slab over the whole area of the building are monolithic. The materials are used economically and with the knowledge that each portion is serving its own useful purpose and is also assisting its neighbour if occasion demands.

If the ground is not very bad—*i.e.*, if the top crust or the strata immediately below the surface have some definite bearing value—then the engineer will use what is known as a ferro-concrete raft or slab. He will not need the piles, but will spread his loads in such a way that he does not over-load the ground. He will construct his beams so that each will transmit its fair share of the load; and by tying them together, both in themselves and by means of the slab or mat as before, he can spread the load until the ground carries only that which is safe. Properly designed and constructed, the raft or slab provides a foundation which will not allow of local subsidence. If subsidence does occur, then the whole raft with the structure imposed upon it will tilt. Provided the load is applied equally, as near as possible over the area of the foundation, the possibility of subsidence beyond the normal amount which any structure causes by reason of the compression of the ground immediately below it is very remote. Ferro-concrete therefore enables the gas engineer to construct his plant upon very bad ground at reasonable cost with the greatest safety and freedom from deterioration. But even in good ground he may effect considerable economies in the initial cost by reason of the smaller bulk of materials required.

The next construction to which ferro-concrete is particularly applicable is the coke hopper or bunker. Coke has very often to be stored while hot, and as a consequence fires often occur in the hoppers. Further, it is of an abrasive nature. It has been the custom to construct storage hoppers and bunkers of steel (I myself have seen such structures which, after being in use for comparatively short periods, have been distorted almost beyond recognition by fire, and worn to shreds by the abrasive action of the coke). Concrete, when composed of proper ingredients mixed in proper proportions, has a heat-resisting factor which is probably only exceeded by firebricks. In addition, it offers, especially when treated with ironite, a surface which will withstand for long periods the abrasive action of the coke. I think this is the only case in which an engineer is called upon to maintain a concrete structure; and such maintenance is almost negligible, amounting only to rewashing with ironite at long intervals. The steel in such a structure as a coke bunker is only necessary to enable the stresses caused by the weight of the structure and the coke to be properly transmitted to the foundations and so to the ground.

For structures in the coke yard ferro-concrete is undoubtedly the best material available at the present time. Whether the coke is handled by telpherage or by crane, the supporting structures are usually in immediate contact with it and must be able to withstand the same conditions as the coke hopper. Timber is useless because of the possibility of fire; and even where steel structures are used, it is usual to case them in concrete to a suitable height in order to protect them from fire and corrosion. With ferro-concrete such structures can be constructed monolithic with the foundation, and present a much better appearance than steel structures. I explained earlier in this paper that the erection costs of structures more than 15 ft. above the ground level will increase the initial cost over steel and other structures; but when finished they require very little attention.

Tar and liquor wells are other constructions which the engineer can undertake in ferro-concrete at reasonable initial cost with no necessity for maintenance, and, what is more important, without the loss of liquor. Water-tight ferro-concrete tanks can be constructed probably with one-fifth of the materials required in mass concrete or masonry, and yet be able to withstand the load from earth and water outside the tank when it is in its worst condition—*i.e.*, empty. Purifier boxes are now successfully constructed in ferro-concrete. Concrete has been improved until it is gas-tight at ordinary pressures. The initial cost when the purifiers are elevated is less than that of cast-iron purifiers in a brick building; while the maintenance charges one can well imagine will be negligible. Oil tanks and storage tanks if constructed of steel need more or less constant attention. Gasholder tanks, whether above or below ground, can be constructed in ferro-concrete with less bulk of materials (and I believe much less labour) and consequently at lower cost than in either steel or masonry. The first cost of such tanks would be practically the last; there would be no maintenance charges, and no loss of water from the tank.

Buildings in the acid-laden atmosphere of a gas-works require constant attention. Cast iron and steel corrode, and brickwork disintegrates unless very highly and expensively finished bricks are used. Ferro-concrete as a material for the construction of buildings is almost unsurpassed. It can be moulded to almost any shape and finished to a surface equal nearly to the best stone. It has of late years been extensively used as a foundation for roads. This has become necessary owing to the increased weight of traffic; and in one or two instances it has been thus applied by gas engineers.

The foregoing are all actual applications of reinforced concrete. I do not propose to anticipate the further applications which the future holds. I hope I have said sufficient to prove to all that are interested in construction that in reinforced concrete they have a medium which will enable considerable economies to be effected, sometimes in initial cost and always in maintenance charges. Such economies are bound to be reflected in the lower cost of gas to the consumer; and further than this, a large proportion of the anxiety to which engineers are prone is removed, allowing them time to look for further chances of reducing production costs.

In conclusion, I would like to say that I have purposely refrained from putting forward on this occasion figures and technical data, the reason being that I propose to supplement this paper with a full contribution next session, when I hope to have the pleasure of submitting figures in support of the assertions and arguments which I have put forward on this occasion.

RESEARCH SUB-COMMITTEE OF THE GAS INVESTIGATION COMMITTEE OF THE INSTITUTION OF GAS ENGINEERS.

The "Fairweather" Recording Calorimeter.

EIGHTH REPORT.

(*Continued from p.* 31.)

TABULAR CONTROL.

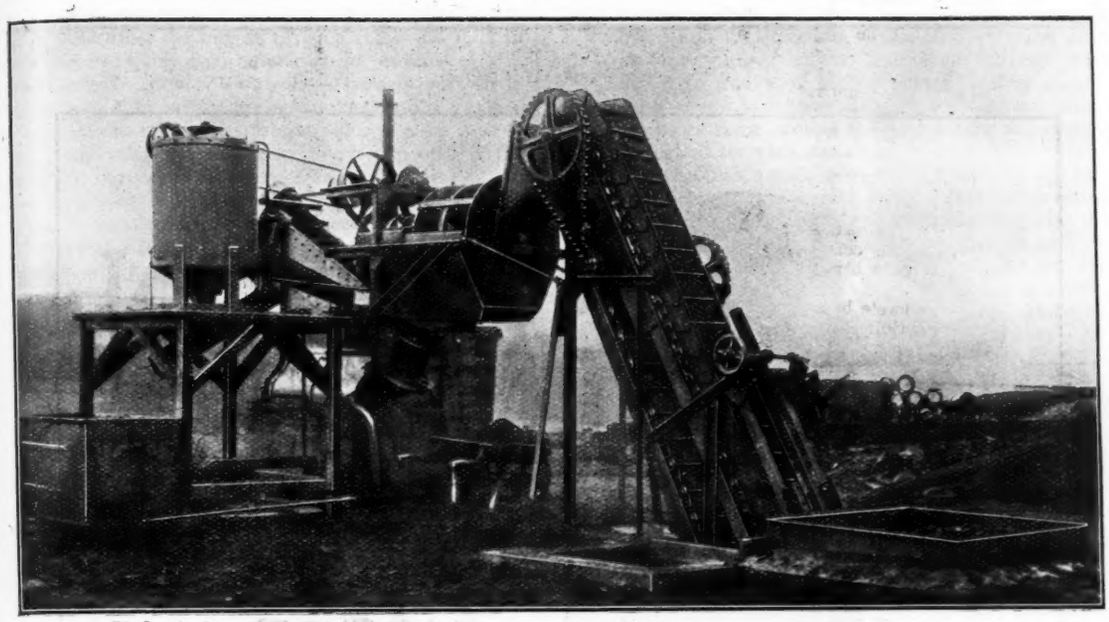
The preceding sections have shown how the water rate should vary if the apparatus is to yield a record requiring no correction for fluctuations in temperature and barometric pressure.

The chamber carrying the float which regulates the water rate is filled with oil as described in the makers' operating instructions for the recorder and communicates with a large air vessel which acts as an aerorthometer. The oil surface is open to the atmosphere so that the aerorthometer is free to respond to variations in barometric pressure, while, in addition, it responds to changes in the temperature of the water supplied to the calorimeter.

The vessel itself is in the form of a copper cylinder 6 ins. in diameter and slightly over 6 ft. in length. The excess water from the top of the water tower runs over the edge of the weir into a distributor and trickles down over the surface of the cylinder. An overflow of about 900 c.c. per minute has been found convenient and used in our tests, but no experiments have yet been made as to the influence of varying this quantity, nor a determination made of the minimum overflow necessary for efficient working of the apparatus. The idea is to bring the temperature of the air in the air chamber to within 0·5° F. of the temperature of the gas in the meter and incidentally close to that of the inlet water temperature of the calorimeter, although exact agreement with the latter is less important. The lower part of the air chamber contains water, so that the air is always saturated with water vapour.

THE "COLUMBUS" COKE SEPARATOR.

(PATENTED.)



THE TYPE "A 1" "COLUMBUS" COKE SEPARATOR AT THE NELSON CORPORATION GAS-WORKS.

Reprinted from the "GAS JOURNAL," Feb. 21, 1923.

LAST week we took the opportunity, kindly offered by Mr. W. E. Price, the Managing Director of the Hampton Court Gas Company, of seeing in action the smaller type of "Columbus" coke separator. In our issue for Nov. 21 last, we described and illustrated the medium-sized machine, an example of which was at the time showing up well under test at the South Suburban Company's station at Lower Sydenham. The opinion was then expressed that this ingenious separator should prove a fruitful source of economy to any gas-works, and that even the smallest undertaking need not shrink from the trouble and the expense of installation.

The separator at the works at Hampton Wick is the type "A1," capacity 2 c.yds. per hour. Constructionally, the main feature of difference from the machine already described is the absence of the feed hopper and elevator; and the plant is, of course, smaller—the material being fed by an easy "throw" direct into the screening drum at about shoulder height. The scheduled requirements of power is 1½ H.P. for the "A1" size; but it is interesting to note that at Hampton Wick the separator is belt-driven off a 3-H.P. gas-engine, which also drives a coke elevator and breaker. For feeding the machine and for supervising the mixing-tank and water-feed, one attendant is enough; and a yard labourer is employed for removing the barrows of fine ash and clinker and coke as they fill up.

Both Mr. W. E. Price and the Manager, Mr. C. T. Price, speak well of their acquisition, and really the results obtained with ordinary retort-furnace and boiler clinker are remarkable. The screening drum accounts, in fine ashes and coke dust, for 29 p.ct. of the material fed in, 17 p.ct. of clinker is removed by the lower worm, and no less than 54 p.ct. of good coke is salved after momentary immersion in the tank. This coke is used for boiler firing at Hampton Wick; but it is our opinion that the surface discoloration resulting from a clay-water mixture should prove no deterrent to a prospective buyer. It should suffice to demonstrate to him the apparatus, and the source and extent of the coating. A market can be found for the fine ashes in the clinker and the concrete block industries.

It is not out of place in this notice to quote the following opinion of the "Columbus" coke separator, given by Mr. James Mitchell, Engineer of the Nelson Corporation Gas Undertaking, on the occasion of a visit by members of the Manchester Junior Association (see "GAS JOURNAL" for Jan. 24, p. 198):

> "A scheme for the prevention of needless waste is that for the recovery of a high percentage of usable coke always found in the ashes from the furnaces of regenerative retort settings. It has long been a matter for regret that this usable fuel should go unsalved, and many have been the attempts to find a solution to the problem. Machinery has recently been introduced which accomplishes the salvage to a remarkable extent, and is known as the 'Columbus' coke separator. This plant is yielding results which are attracting the attention of gas engineers throughout the country. . . . From an inspection of the machine and specimens of the sorted products, it is evident that the separator is as nearly perfect as is possible, The coke, not being in contact with the water more than a few seconds, is remarkably dry. It is claimed for this machine that 30 p.ct. of the ash is recovered in the form of usable coke, which, with a coal consumption of 24,000 tons, represents the saving of 540 tons a year which would otherwise be deposited on the refuse dump. If this reclaimed fuel were used exclusively for a works producer and boilers, the same weight of fresh coke would be liberated for sale; and at the very low value of £1 per ton, a substantial saving would result."

The **Columbus Machinery, Ltd., Caxton House, Westminster, S.W.,** beg to say that they have since received from Mr. James Mitchell, of the above-mentioned Nelson Corporation Gas Undertaking, the following report of actual tests made on his installation.

"In accordance with your request I have pleasure in furnishing you with the following test of clinker treated by our 'Columbus' Separator installed here in December last.

	T.	C.	Q.
Weight of material treated	3	0	1
Time, 2 hours.			
Percentage of usable coke recovered			42·15
Percentage of clinker			26·44
Percentage of dust			31·41

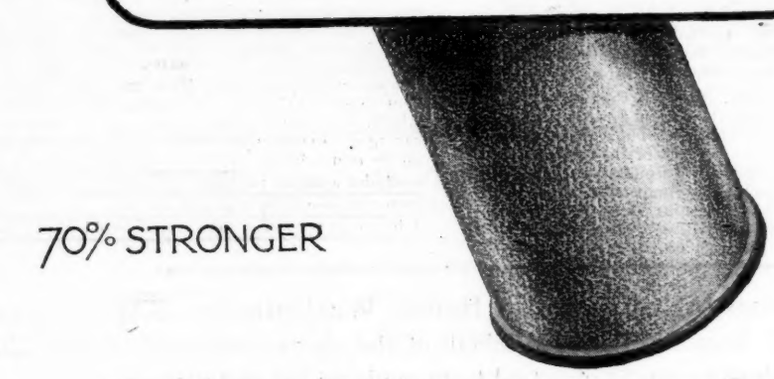
The machine has proved itself in every respect, and I can with every confidence recommend it as a paying proposition to any Gas Undertaking."

STANTON
SPUN IRON PIPE

MOULDED BY CENTRIFUGAL ACTION

Standard Sizes delivered from Stock.

DIAMETER.	LENGTH.	WEIGHT		
Inches.	Feet.	C.	Q.	Lbs.
4	12	1	1	21
6	12	2	2	0
8	12	3	2	14
10	12	4	3	14
12	12	6	1	0



70% STRONGER

THE STANTON IRONWORKS COMPANY LIMITED
NEAR NOTTINGHAM.

Telephone: 86 ILKESTON. Telegrams. STANTON. ALFRETON.

This part of the apparatus is unavoidably very large and heavy and with the amount of oil and water involved represents a considerable thermal capacity. Some lag is, therefore, to be expected in responding to rising or falling water temperatures and the C.V. record will not be correct until equilibrium has been attained. Experiments are in progress to determine the effects of such rises and falls in temperature as are likely to be met with in practice.

Experience with Tabular Control.—There is very little to go wrong with this part of the apparatus, and in general the readings of the oil on the tabular gauge have agreed very well with what would have been expected from readings of the barometer and meter thermometer.

There are, however, a few minor deviations to be considered, and it should be pointed out that any error in the tabular control is reflected in a proportionate variation in the water-flow and charted calorific value.

1. A very minute leak on the air chamber or one of its connections caused trouble for some weeks, but was eventually located. The effect of such a leak is to cause the reading of the tabular gauge to gradually approach 1·000, and is, therefore, most easily detected when atmospheric temperature and pressure are such as to cause the tabular gauge reading to be considerably different from 1·000 for several consecutive days, there is then a gradual drift of the reading toward 1·000. With the tabular gauge fluctuating slightly above and below 1·000 a leak cannot be detected unless very bad.

2. From time to time accumulations of water have had to be withdrawn from the oil chamber, by the valve below the tabular gauge, the effect of such water being to raise the position of the oil on the gauge, thus making it read too low and give too small a water delivery. Most of this water is introduced by way of the float spindle when cleaning the water jet or adjusting the cup, but a certain amount seems to be due to spontaneous splashing above the float chamber.

   Better guarding of the float spindle and a larger distributing cone for the water should reduce this trouble. The presence of water is easily detected by opening the valve of the air chamber, when if no water is present the oil in the gauge should fall exactly to 1·000.

   40 c.c. of water corresponds to 0·001 on the tabular gauge. Occasionally the accumulation of water has caused the tabular gauge to be in error by as much as 1 p.ct.

3. Leakage of oil from the reservoirs we have not experienced, but this if it occurred would at once show as a deficit of oil in the gauge on opening the air chamber, as under (2).

4. In view of the large volume of oil in use, its thermal expansion under variations in room or water temperature may not always be negligible.

   Approximately the effects will be as follows, assuming a co-efficient of expansion of 0·00036 per ° F. for the oil, and a temperature change of 10° F. :

TABLE 6.

Tabular Number.	Approximate Length of Oil col. in Gauge.	Rise in Inches for Increase of 10° Fahr.	Error on Tabular Gauge.
	Inches.		
0·90	13	0·047	0·0012
1·00	9	0·033	0·0008
1·10	5	0·018	0·0004

5. In order that the oil expelled from or drawn into the air chamber may give the correct rise or fall to the cup controlling the head of water on the jet, the oil rises and falls in a specially shaped float chamber in the form of a truncated cone with slightly concave sides and placed narrow end downwards.

   The computation of the exact outline to be given to this vessel is very involved, but we have carefully calibrated it and calculated the rise and fall of the oil which would be produced therein for certain changes in the tabular number in the air chamber. From $n = 0{\cdot}900$ to $n = 1{\cdot}080$ the rise and fall of the oil correspond with the assumed change of tabular number within 0·1 p.ct., thus indicating excellent design and workmanship. On the short portion of the gauge between 1·08 and 1·10 the error rises to 0·2 p.ct., and the vessel does not seem to taper quite enough on this range (about 3-16 in. more taper on 6-in. diameter is required). We have, however, had no occasion to use this extreme position on the gauge, all our readings falling between $n = 0{\cdot}92$ and 1·02 in the period during which the instrument has been under examination. The use of the extreme ends of the gauge will, however, only be called for occasionally.

6. If the tabular gauge does not agree with the tabular number as determined from direct observation of the barometer and meter thermometer, and one is satisfied that there is no error due to any of the causes indicated under headings 1-5, or due to lack of equilibrium with a changing water temperature, then the capacity of the air chamber is at fault.

   The makers have provided for this by fitting a gauge glass and variable water ballast to the lower part of the air chamber. If the movement of the oil in the float chamber is too great, the capacity of the air chamber is to be diminished by the addition of more water ballast and *vice-versa*.

   The range of movement of the oil on the tabular gauge is to be expressed as a percentage of that expected from the corresponding observations of the barometer and meter thermometer. If it differs from 100, the capacity of the air vessel must be altered in the same proportion. As the effective length of the air chamber is 57 ins., approximately 0·6 in. of water on the lower gauge glass corresponds with a 1 p.ct. adjustment.

For final testing of the correctness of the adjustment it is preferable to wait for spontaneous variations in the tabular numbers causing a movement over at least a quarter of the gauge length, and weeks may elapse before this opportunity occurs. In the case of the instrument supplied for this investigation the water ballast had been very carefully set by the makers and has not been altered. It is not advisable to readjust the water ballast for small differences in the gauge readings without first examining the instrument for defects under headings 1-5 above.

Most of our tests have been made using the circulating system, and, therefore, with water not far removed from room temperature, an opportunity has not occurred for testing the reliability of the recorder upon a water supply at a temperature which is steady but considerably different from room temperature, such as would occur (say) by feeding the apparatus with town water at 40-50° F. in a testing room at 60-65° F.

This is an important point, for the makers claim that by their system of water-jacketing of air chamber and meter with running water at the same temperature as that supplied to the calorimeter, they are substantially immune from any errors which would arise from variations in room temperature. The point will be investigated at an early date.

Further notes upon constructional details will be found in Appendix 2.*

* This will be given in a subsequent issue of the "JOURNAL."

(To be continued.)

Gas for the Cement Industry.—The United States Geological Survey schedules 115 cement plants as operating in 1921. While pulverized coal was used in whole or in part in 99 plants, and crude oil in 19, gas was burned in only four, and but one of these relied upon it exclusively. This has led to the suggestion, by a writer in the "Gas Age-Record," that if the great quantities of coal now employed for the purpose could be used to produce gas in big gasifying plants at the mines, and then the gas were forced through mains to the industrial centres, difficulties of fuel freightage, &c., would be overcome. Though the cement plants are widely scattered, they could usually be reached by pipe-lines serving other industries or communities. It is pointed out that the entire absence of ash from a gas-flame would constitute a real advantage, as the ash from powdered coal must be taken into account in proportioning the raw materials burning to cement clinker in the kilns. To attain the intense heat of 2500° to 3000° Fahr. required in burning the raw materials to cement clinker, coal must be ground so finely that it burns much like a gas-flame. A practical and economical plan of securing this flame without handling the coal should meet with wide favour.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Caton and Coombs' Safety Devices for Stoking Machinery.

Sir,—With reference to the article on "Safety Devices for Stoking Machinery" in your issue of the 4th inst. [p. 36], we wish to point out that this firm has already previously fitted automatic catches for holding the frame in case of accident to the hoisting chains.

For W. J. Jenkins & Co., Ltd.,
J. L. Butler, General Manager.

Beehive Works, Retford,
April 9, 1923.

Capital for Gas Undertakings.

Sir,—Referring to the District Conference of the "B.C.G.A." held at Gloucester on March 14, I very much regret that the statement placed by me before the meeting (and reported in your issue of March 21) was incorrect as to one undertaking at all events. The error gives the General Manager of the Birmingham Gas Department an opportunity of showing the splendid financial position there, and how small a proportion of the cost of gas is now necessary in order to pay interest on the capital involved.

But Mr. A. W. Smith's letter also calls attention to the difference between the capital position of municipal gas undertakings and that of gas companies; the first-named being compelled by law to reduce their capital, and the latter being unable to do so. It is seldom that the capital position is considered by boards of directors; and it would probably be a matter of interest if, at the "B.C.G.A." meeting to be held at Birmingham in the autumn, this matter could come up for discussion.

J. H. Jones, Chairman.

Gloucester Gas Company, April 9, 1923.

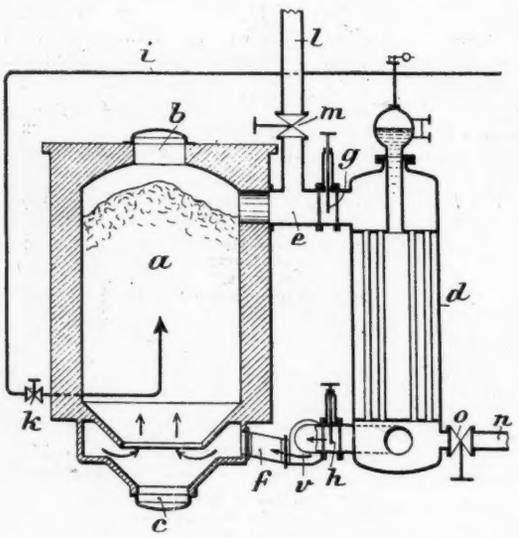
REGISTER OF PATENTS.

Coke-Cooling with Production of Water Gas. No. 173,763.

Sulzer Frères Sté. Anye., of Winterthur.

No. 47; Jan. 3, 1922. Convention Date, Jan. 3, 1921.

This invention relates to a method of, and apparatus for, cooling incandescent coke, after its discharge from a distillation plant, and simultaneously obtaining water gas therefrom by passing steam through an airtight chamber containing the coke. One form of apparatus according to the invention is shown diagrammatically in the accompanying drawing.



A Coke-Cooling and Water-Gas Device.

The apparatus comprises a receptacle *a*, into which the incandescent coke from the retorts is introduced through an opening *b*; the coke, after completion of the cooling process, being discharged through the outlet *c*. A steam generator is indicated at *d*, the heating chamber of which is connected at its upper end to the receptacle *a* by means of the pipe *e*, and at its lower end by the pipe *f*. A blower *v* is arranged in the pipe *f* by which the gases contained in the receptacle *a* and in the heating chamber are forced in a cycle through both chambers, so as to transfer the heat withdrawn from the coke by the gas to the generator for the production of steam. The pipes *e* and *f* are respectively provided with shut-off valves *g* and *h*, so that communication between the coke receptable and heating chamber can be interrupted at will.

Connected to the steam space of the generator *d* is a steam-pipe *i* leading to the coke receptacle and controlled by means of a regulating valve *k*. The water gas generated by the passage through the coke of the steam from the pipe *i* is drawn off by a pipe *l* controlled by a valve *m* either to an accumulator or to the place of consumption. Another pipe *n*, having a stop valve *o*, is provided, by means of which the water gas can be conducted through the heating chamber of the generator with the object of utilizing the heat of the gas.

The plant is operated in such a manner that the total amount of heat yielded by the first filling of the container *a* is used for the generation of steam. For this purpose the valves *k*, *m*, and *o* are shut, and the valves *g* and *h* opened. The blower *v* is started, whereby the gases are forced through the two chambers in a cycle, thus transferring the heat of the coke to the water in the generator and converting it into steam. If sufficient steam is generated in this way, the container *a* is discharged and filled again with incandescent coke, the valves *g* and *h* are shut, the valve *m* opened, and thereafter steam is passed into the incandescent coke by opening the controlling valve *k*. The water gas thus generated is led through the pipe *l* to the accumulator or place of consumption. As soon as the coke cools to a temperature of about 700° C, the valves *m* and *k* are closed, but the valves *g* and *h* are opened; and by restarting the blower *v*, the heat which the coke still contains is again utilized for the generation of steam. In this manner it is possible to generate the steam required for the production of water gas from the next charge.

When the coke is quite cool it is discharged from the container, and a new charge of incandescent coke is introduced; the various valves and dampers being adjusted first to produce water gas followed by the generation of steam as above described. Instead of leading the hot water gas directly to the accumulator or to the place of consumption, after it leaves the container, it may be conducted through the heating chamber by closing the stop valve *m* and opening the valve *o*, thus utilizing the heat of the gas to assist in the generation of steam.

Boxes for Inverted Gas-Mantles.—No. 193,494.

Sutton, C. J., of Bolton.

No. 31 433; Nov. 24, 1921.

This invention relates to improvements in connection with boxes for the reception of inverted incandescent gas-mantles of the type formed from a single blank which is partly cut and partly marked so that when folded in the correct manner a complete box is formed to contain and support the mantle in its desired position. In boxes previously constructed means are provided for securing or holding two of the lugs of the mantle support in position, and sometimes the third has been also supported by a lip on the front wall of the box. The present invention consists in so constructing the blank out of which the box is made that a lip of this character is produced out of the blank to overlap the remaining supporting lug so that the mantle is held in its most appropriate or safest position; the blank being so constructed that the section in which the lip is made forms a front wall or lid, a base piece, and a rear wall of the box, so that when the lid is being opened or closed it will hinge on the bottom edge of the box remote from the mouth and allow more readily the insertion or removal of a mantle.

Fastening Device for Retort Doors, &c.—No. 193,749.

Dempster, R. & J., Ltd., and Beard, H., both of Manchester.

No. 12,571; May 4, 1922.

This invention is for an improved catch for use in the opening, closing, and fastening of the doors of the mouthpieces of gas-retorts and of other like doors, such as those provided for the removal of foul oxide from purifiers. The device is pivoted near to the mouth of the retort, and on being struck by the in-moving door is forced into the locking position; also when the end of the locked catch is struck the door is unlocked.

The object of the invention is to provide a slotted catch suspended from a pivot, and with an integral part adjacent to the slot literally projecting towards the mouth of the retort. This projecting part is capable of being struck by a projection on the door as the latter projection engages the slot, for being locked therein. The arrangement provides that the striking of the lower end of the catch results in the joint between the door and the retort mouth being broken, by the projecting part of the catch striking the door part engaging the slot in the catch.

Incandescent Gas-Burners.—No. 193,555.

Wildbore, J. E., of Oldham.

No. 33,038; Dec. 9, 1921.

This invention relates to incandescent gas-burners of the kind which are known in the trade as cluster burners; and the objects thereof are to facilitate cleansing, to reduce the cost of production, and to improve the action.

The invention consists in providing a loose top on the chamber which connects the supply to the cluster of mantle holders. In one construction the vertical supply-tube, through which gas issuing from the nipple and air-pass to the head of the burner, is formed internally of such diameter as to form a sliding fit on the smooth cylindrical portion of the nipple. The head of the burner consists of a flat disc having a peripheral flange projecting in an upward direction and a flat disc adapted to rest on this flange and having a peripheral flange projecting downwardly adapted to form internally a loose sliding fit on the exterior of the first-named flange. The first-named disc has a central hole in which is riveted a tubular member, the internal diameter of which is such as to form a loose sliding fit on the upper end of the vertical tube. An internal shoulder is provided in the tubular member, to rest on the top of the vertical tube or on a spring projecting from the tube. The disc is also provided with two or more holes for the reception of tubular externally screw-threaded members, which serve to receive the usual fire-proof mantle supports. The second-named disc is externally forced inwardly at its centre so as to produce a convex bulge or projection lying vertically above the central

aperture of the first-named disc. Gas entering the chamber formed by the discs is guided in a gentle manner by the bulge or projection into radial paths at right angles to its direction of entrance, instead of, as hitherto, being turned back on itself and setting up a back pressure.

In a modified construction the bulge or projection for deflecting the gaseous mixture as it enters the head of the burner may be in the form of a conical member rigidly fixed to a screw provided with a knurled head which is situated outside the chamber and screws into a screw-threaded hole provided in the centre of the disc. By rotating the screw the conical member can be adjusted towards or away from the central gas inlet of the head for the purpose of varying the back pressure of the tube, and thereby regulating the quantity of air drawn in through the holes to suit both the quality and pressure of the gas supplied to the burner.

It is claimed that by this invention the cutting of screw threads on the burner is reduced to a minimum, whereby the cost of production is cheapened; the chamber in the head of the burner can be quickly opened and cleaned by simply lifting the upper disc, and back pressure in the burner is reduced to a minimum.

Economizer for Use on Gas-Stoves and Rings. No. 193,877.

HAMMOND, M., of Twickenham.

No. 14,888; Feb. 14, 1922.

This invention relates to portable devices to enable two or more utensils to be heated by one burner of a gas-stove, or by a gas-ring. It is made of sheet steel of rectangular shape with flanges at the sides bent to an angle of 90°. The ends of the flanges are notched at an angle of 90° to allow the end of the plate to overlap the edge of the stove; the plate thus lying flat on the bars of the stove. There is an aperture at one end for placing over the gas-burner to take a cooking utensil, at the same time another utensil is placed on the other end; thus two vessels can be heated simultaneously with one burner.

In a modification, for use over a gas-ring, the flanges are provided at the ends also and are extended to form four legs; the gas-ring being placed under the aperture, two vessels can be heated simultaneously.

Gas-Burners—No. 193,972.

KEITH AND BLACKMAN CO., LTD., and Keith, G., both of London.

No. 32,417; Dec. 3, 1921.

This invention aims at a construction of a drip-proof gas-burner, primarily adapted for cooking purposes, which will be of high efficiency. This burner was described in "THE GAS SALESMAN" for March 28, p. 43, so that it will suffice here to give the claim of the patentees—a drip-proof gas-burner in which each burner head has jet orifices protected by an eave, and is received in a pocket in a built-up refractory member of disconnected sections, by the walls of which pocket the flames are deflected; the refractory member being also adapted to radiate heat upon the vessel impinged by the flames so deflected.

Gas-Burners.—No. 194,003.

HOWLETT AND CO., LTD., and DOLPHIN, J., of Birmingham.

No. 33,071; Dec. 9, 1921.

The object of this invention is to provide an improved construction of burner nozzle which will more successfully prevent lighting-back. The burner nozzle is made of refractory material, and has a grid formed integral at or near its discharge end, which grid consists of a central ring connected by substantially radial arms to the wall of the nozzle; and these arms are extended longitudinally along the wall of the nozzle so as to form on the interior wall a number of inwardly projecting longitudinal ribs which extend to the grid.

The ribs are of a substantial length, and at their inner ends they may be arranged to taper into the internal surface of the nozzle. In the construction the width is about equal to one quarter of the internal diameter of the nozzle. In operation they get extremely hot and serve to heat the mixture before it is ignited. In addition they serve to break the mixture up into a number of separate streams, and it is found in practice that they are effective for preventing lighting-back. The provision of the ribs upon the inner wall of the nozzle increases largely the surface area. This results in greatly increased friction for the gases passing, in a manner which is equivalent to the effect obtained by inserting a piece of wire gauze. The invention is equally applicable to burners which employ vapourized oil or spirit generally mixed with air as fuel.

Gas-Heaters.—No. 194,147.

WOLFF, A. H., of New York.

No. 7426; March 14, 1922.

This invention relates to gas-heaters of the type wherein the gas flame is directed against refractory radiants, the burner allowing of aeration which will secure substantially complete combustion of the gases.

A reflecting casing is provided, the front surface of which is in the form of a dished reflector. This casing is provided with a central opening, at the back of which is a housing forming a combustion chamber. This housing is closed at the bottom by the burner structure and open at the top, with the side walls extending against the rear wall of the reflecting casing. By reason of the intense heat developed by the burners, the walls are either made of refractory material, such as fireclay, or of sheet metal with a heat-insulating refractory sheet, such as asbestos, between two formed metal sheets.

Enclosing the housing forming the combustion chamber, with its top curved forwardly over the open top of the housing and across the top of the reflecting casing, is a flue-forming casing, the inlet of the flue being adjacent to the burner structure, and its outlet being above the reflecting casing and directed horizontally to the heater. This flue casing is constructed in such a way that the radiant heat from the walls of the combustion chamber will heat the air entering; but while such air-heating chambers have hitherto been kept rigorously separated so as to prevent any of the products of combustion from entering, the latter, according to the present invention, are intentionally directed into the air-heating chamber, where they commingle with the hot air. By this admixture of pure air to the fumes, practically complete combustion of the gas is secured, so that the mixture is inodorous and may without danger be emitted into the room.

In addition to the effective utilization of the heat radiated rearwardly of the combustion-chamber housing, and of the products of combustion and heated air as a result of their being collected and directed horizontally into a room, the flue-forming means will also serve to keep the back of the heater sufficiently cool to avoid risk of fire. It will permit of the use of a handle to facilitate the transportation of the heater from place to place in a room. While the construction of the burner itself is such as to provide an adequate supply of air for supporting combustion, the opening in the reflecting casing and the arrangement of the housing forming the combustion chamber, will also cause air to be introduced about the flame and about the radiant elements from the front of the casing. This air will support combustion about the radiants, any oxygen not consumed being delivered with the products of combustion into the flue.

By providing a reflecting casing, light and heat rays from the refractory elements will be thrown forwardly of the heater, thus securing a more effective distribution of the heat and imparting added brilliance to the fire. While a true circular dished reflector may be used, it is preferable to provide a horizontal corrugated reflecting member, extending across the lower portion of the reflector at about the plane of the bottom of the combustion chamber. This reflecting member will receive light and heat rays from close to the burner and direct them against other portions of the reflecting surface of the casing in a manner to increase the brilliancy.

The burner consists of a mixing-chamber casing having circular burner openings at the top, and vertical tubes, the tops of which are centred in relation to the burner openings, and the bottoms of which extend through the bottom of the mixing chamber and open to the atmosphere, thus producing a substantially circular flame and providing a supply of secondary air within, as well as about, these openings.

Discharging into the mixing chamber is a mixing tube of ordinary construction, provided with a cut-off valve and air regulator. This tube opens within the mixing chamber, and discharges into an enlargement on one side of the vertical tubes, so that the incoming mixture will be equally distributed to all of the burner openings.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for April 5.]

Nos. 8466 to 9041.

ANTON, N.—"Automatic gas igniter." No. 8948.
BOIVIE, S E.—"Burners." No. 9016.
BRAYSHAW, E. R. & S. N.—"Gas-burners for metallurgical furnaces." No. 8518.
CHANDLER, D.—"Gas-burners for cooking." No. 8988.
COOKE, J. J.—"Cocks for fluids." No. 8987.
DEMPSTER & SONS, LTD., R.—"Lids for gas-retorts." No. 8771.
DISTILLERS COMPANY, LTD.—"Apparatus for dehydrating, purifying, or separating liquids, gases, &c." No. 8949.
FRICKER, E. H.—"Atmospheric gas-burners." No. 8919.
GAS LIGHT AND COKE COMPANY.—"Preparation of combustible materials." No. 8537.
GAS LIGHT AND COKE COMPANY.—"Handles for hollow-ware." No. 8617.
GILLETT, A. S.—See Boivie, S. E. No. 9016.
HOLMES, G. E.—See Gas Light and Coke Company. No. 8537.
HOLT, E. C.—See Gas Light and Coke Company. No. 8617.
KIMPTON, H. J. P.—"Gas fires, stoves, &c." No. 8664.
M'GREGOR, R.—See Distillers Company, Ltd. No. 8949.
MEADE, A.—"Purification of gases." No. 8553.
MOSS, E. B.—"Apparatus for measuring and/or indicating flow of fluids." No. 8618.
PIGGOTT & CO., LTD., T.—"Lining pipes, &c., with cement, &c." No. 8921.
RADIATION, LTD.—See Brayshaw, E. R. & S. N. No. 8518.
ROXBURGH, R. L.—"Valve for regulating pressure in gas-fired steam-boilers, &c." No. 8900.
SOUTH METROPOLITAN GAS COMPANY.—See Cooke, J. J. No. 8987.
SOUTH METROPOLITAN GAS COMPANY.—See Chandler, D. No. 8988.
TOOGOOD, H. J.—See Dempster & Sons, Ltd., R. No. 8771.
TULLY, C. B.—"Production of combustible gas." No. 8738.
VISSE, A.—"Gas-burners." No. 8667.
WALKER, A. E.—"Geysers." No. 8721.

The Woodall-Duckham Vertical Retort Company.—We are informed that Messrs Gibbons (Dudley), Ltd., Messrs. Newton Chambers & Co., Ltd., and Messrs. Thomas Vale & Sons, Ltd., having sold the whole of their shareholding in the Woodall-Duckham Vertical Retort and Oven Construction Company (1920), Ltd., have ceased to be members of the latter Company—all the shares of which are now owned by Messrs. Woodall, Duckham, and Jones (1920), Ltd.

Value of the Bridlington Gas Undertaking.—An expert adviser was called in by the Bridlington Town Council to estimate the value of the Bridlington Gas Company's undertaking, with a view to the possibility of the Corporation's taking it over. It is reported now that the price at which he arrived is over £130,000. The capital of the undertaking, it is understood, is from £50,000 to £55,000. It is stated that, in the event of the price offered being satisfactory, the Gas Company are not unlikely to be willing to sell.

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" with regard to applications to the Board of Trade for Orders under the Gas Regulation Act.

SPECIAL ORDER.

Yorktown and Blackwater Gas Company.

Application is to be made by the Company to the Board of Trade for a Special Order under section 10 to empower them to purchase the undertaking of the Twyford (Berks) Consumers' Gas Company, Ltd., and to confirm the agreement entered into with that Company; to enable the Company to raise further capital, and to use scheduled land for gas-works purposes; to extend the limits of supply; and to make provisions regulating the charges for gas.

DECLARATIONS OF CALORIFIC POWER.

Brentwood Gas Company.—480 B.Th.U., in substitution for 450 B.Th.U. (June 30.)

Newark Gas Company.—450 B.Th.U., in substitution for 410 B.Th.U. (July 1.)

GAS REGULATION ACT ORDERS.

Copies have been forwarded by the Director of Gas Administration of the following further Orders made by the Board of Trade under section 1 of the Gas Regulation Act.

Glastonbury Corporation.

After the declared date, the maximum price in respect of gas supplied by the undertakers shall be 18d. per therm.

Prepayment meter clauses are included. (March 29)

Wilmslow and Alderley Edge Gas Company.

After the declared date, the maximum price in respect of gas supplied by the undertakers shall be 16d. per therm. (March 28.)

SALTLEY GAS EXPLOSION.

The Birmingham City Coroner (Mr. Isaac Bradley), with a jury, resumed the adjourned inquest at the Victoria Courts on Thursday last on the body of Thomas Sheridan (39), stoker, who was fatally injured in the explosion at the Mond Gas plant at the Saltley Gas-Works of the Birmingham Corporation on Sunday, March 4. (The opening of the inquest was reported in the "Journal" of March 14, p. 701.) The Court were occupied most of the day; and in the end the jury returned a verdict of "Accidental Death," and expressed sympathy with the relatives, and those who had suffered in consequence of the explosion, and commended the work of the police force and fire brigade.

To assist the jury to understand the working of the Mond plant, models were arranged of power houses, superheaters, tar washers, gas tower, water-cooling tower, and ammonia absorber.

The Coroner observed that when he opened the inquiry he feared that one or two of the other men might die; but he was thankful to say that no other death had occurred. The medical evidence given previously was that Sheridan's death was due to shock, aggravated by carbolic acid poisoning.

Mr. C. Ashton (Solicitor) appeared to represent the Birmingham Corporation Gas Department (the Manager of which, Mr. A. W Smith, was present). Others in attendance were Mr. G. Stevenson Taylor (Senior Engineer Inspector of Factories, Home Office, London), and Mr. L. Ward (Inspector of Factories for East Birmingham); Mr. F. Foster (Chief Engineer at the Birmingham Gas-Works); and Mr. Simpson, representing the Gasworkers' Union.

Mr. *Cecil Carrington Barber* (Resident Engineer at the Saltley Works), described the plant, which he said was put down in 1913. It had been in active use since; and ordinarily produced about 9,500,000 c.ft. of gas per day. He described the processes of manufacture by the aid of the model; and said that during the process they got a deposit of fine carbon dust, which on exposure to the air fired very rapidly. If dropped down four or five feet it would ignite without light or spark before touching the ground. Thrice a year the plant was closed down and cleared; but they sometimes got a partial stoppage in the collecting main. He explained the process in detail, and the precautions taken. Steam was injected in order to damp-down the carbon, and the deposit was chipped off with iron bars. Mond gas became an explosive mixture with about the same volume of air, but would not explode without a light. A sudden rush of air into the pipe containing the minute particles of carbon might cause them to ignite.

Mr. *Barber* pointed out that it was intended to shut down the coke ovens for eight hours on Sunday, March 4; and he gave instructions to the foreman to have the pipes partially cleared. He saw the men at work at 9 a.m., when everything was proceeding satisfactorily. Gas was escaping through the ball-holes at the main, showing that no air could enter. He was at the plant again at about a quarter to eleven; and gave instructions with regard to the spraying of water on the carbon which was being removed. The work seemed to be progressing favourably; and he went to a retort-house about 330 yards away. About ten minutes later he heard an explosion. This was followed by a second explosion. He ran towards the plant; and saw that the crown of the gasholder had a 15 ft. rent in it. Resting on the top was the lid of one of the spray arresters, which had been hurled about 160 ft. He had the rent covered with wet bags to prevent a more serious explosion, and took all other measures to prevent the spread of fire.

Hammering the Pipe.

Ernest Gwynne, the shift foreman, said he had been familiar with the plant since 1913. He gave instructions for a steady pressure of steam, and proceeded with the work. They cleared the collecting main until they got to the bridge main when they endeavoured, by hammering, to remove a pipe that was hindering progress. They were cutting the pipe away when the explosion occurred. Sheridan was found at the far end of the washer. He was pinned to the ground by the plate of the cooling-tower. Water and tar had overflowed from the washer, and Sheridan was covered with tar.

Thomas Cooksey, who worked with Sheridan, stated that no one was smoking at the time of the explosion. He heard the thud of falling dirt into the washer; and added that this was followed immediately by the latter overflowing, and a flash.

John Hall, workman, declared that there were two explosions. He also stated that no one was smoking.

George Lavender, fitter, gave evidence to the effect that his instructions were to take out a water spray—a 2-in. iron pipe—on the bridge main; and to break the socket, he had to hammer for at least a quarter of an hour. He observed that gas and dust were coming from underneath. At his request the foreman stopped the men working. The flash then occurred; he remembered nothing more.

Robert Henry Brown, labourer, said that on the Tuesday following the explosion he took the manhole plate off the washer and found that 15 cwt. of dirt had fallen into it. There was a space in the front of the washer where the water had been forced out through which the air could enter.

Mr. *Barber*, recalled by the Coroner, said it was clear that the explosion was internal to the plant.

The Coroner: If the air entered, an explosive mixture would be formed, and that might ignite the carbon?

Witness: A rush of air would ignite the carbon.

Answering further questions, Mr. Barber stated that at the time of the explosion he formed no opinion how it occurred; but after seeing the accumulation of fallen dirt in the bottom of the washer, and having a conversation with Gwynne, he thought the whole explanation was perfectly clear. The explosion was localized. In the bridge main the carbon was not disturbed.

The Coroner: Having heard all the evidence, and from your own knowledge, what conclusion have you come to in your own mind?

Witness: The fall of the deposit displaced the water in the lute, which, through a backwash, allowed an entry of air which formed an explosive mixture. There was a displacement of the water in the washer. Then came the first explosion, a second one taking place in the absorber owing to the air being drawn in consequent on damage to the washer.

Dislodging Carbon Deposit.

Your opinion is that while, as we have heard, this deposit can be dislodged in small lumps by an iron bar, in this case the hammering probably dislodged a large quantity?—Yes.

The witness added that he had never known such a large deposit to fall at once. The plant, which had been idle for eighteen months previously, was restarted last October; and just previously it was cleaned from end to end.

The Foreman: You think that the cleaning was thorough?—Yes. Then can you account for this heavy deposit?—I can only think that it was due to the fuel, some of which is more carbonaceous than other and of a richer quality, which would leave a heavy deposit.

From the fitter's point of view, do you think that it was necessary to have all this hammering on this piece of mechanism?—If we had known there was such a heavy deposit, we should never have hammered it.

Witness said it was quite true he was not present at the hammering; but if he had been present he would probably have done the same. Those products in the main resulted from using a different kind of fuel.

The Foreman: Suppose the accumulation enclosed the whole of the inside of the pipe, how would you know it?

Witness: We should get at least three days' notice of it from the state of the gauges.

You were not responsible for the hammering?—That was done on the instruction of the foreman.

Does that show a want of knowledge or care on the part of the foreman?—Not the slightest. I defy any man living to have found it.

Do you think that the hammering has any bearing on the explosion?—Yes I think so.

Mr. *Barber*, concluding his evidence, acknowledged the prompt manner in which the fire brigade and the first-aid corps dealt with the situation.

The Coroner, in his summing-up, paid a similar tribute to the fire brigade and the police, remarking that he had found that in these situations people behaved very well. On the evidence given, no verdict other than that of "Accidental Death" was possible.

The Jury concurred in this respect, and with regard to the work of the fire brigade and the police. They sympathized, they added, with those who had suffered through the explosion.

The Bakewell Gas-Works Problem.—A statement was presented at a meeting of the Bakewell Urban Council, by the Chairman (Mr. A. Buxton), regarding the Council's position in connection with the recent successful action brought by the Marquis of Granby respecting the alleged poisoning of fish in the River Wye caused by liquid deposits from the gas-works. The Council discussed the position, and Mr. G. Allsop emphasized the fact that the matter could not remain dormant. He thought that the ratepayers of Bakewell should be called together to consider what he urged to be a very serious problem. No further action was taken.

YORKTOWN AND BLACKWATER GAS COMPANY.

The Annual Meeting of the Company was held on March 29, Alderman D. SPARVELL, J.P., presiding. In their report the Directors stated that, in common with many other companies, they had experienced a reduction in the sales of gas during the year 1922. They intended to reduce the price of gas by 1d. per therm after the April meter readings. After paying all charges, there remained a balance of £10,559, out of which they recommended the payment of dividends of 12½ p.ct. on the original shares, and 8 p.ct. on the old and additional shares (less income-tax).

The CHAIRMAN said that, before turning to the accounts, he would like to pay tribute to the great loss which they had sustained by the death of Mr. Alfred Kitt, who had been a Director of the Company for a number of years, and whose knowledge, as a civil and gas engineer, had been of the greatest help in the past. Coming to the results of last year's working, there had been a reduction in the sales of gas of about 2½ p.ct. This was owing to the fact that during 1921 there had been a very great increase in consumption due to the coal strike; and the Company had maintained an unrestricted supply during this period. He was glad, however, to state that their output of gas was showing a very tangible increase this year. With regard to new mains, they had been successful in obtaining an order to extend the Company's area of supply to the parishes of Winnersh, Newland, and Barkham; and as they found that building was rapidly developing in parts of these parishes, they were extending the mains to cope with the demand. Revenue account, manufacture of gas, purifying materials, wages at works, and repairs maintenance at works all showed a satisfactory decrease. Turning to the distribution of gas, repairs to mains showed a decrease, but renewals to meters and cooking-stoves showed an increase. The increase in the former was due to the fact that large quantities of meters had been held-up for repairs owing to the coal strike, and they were only just getting back to normal conditions again. With regard to repairs to cookers, they were doing their utmost to see that every cooker which left the works was made thoroughly efficient and adjusted properly. After paying all charges, there remained a balance of £10,559, which was a very satisfactory state of affairs. They would have noticed from the balance-sheet that they were proposing to make an application to the Board of Trade for an Order to take over the Twyford Gas Company; and if this was accomplished, it would add a very valuable district. They had been handicapped for want of more storage accommodation for gas. Owing to the very high price of materials they had deferred the matter until more favourable conditions; but had now placed a contract for the erection of a gasholder with a capacity of 500,000 c.ft., and this they hoped to have in action in the early autumn. They had also installed the latest type of ammonia washers, and by their use they had every hope that their results from the manufacture of sulphate of ammonia would be greatly improved.

On the motion of Mr. R. W. Edwards it was resolved that the number of Directors should remain as at present, and that the remuneration should be at the rate of four hundred guineas per annum, as from Jan. 1, 1922.

The CHAIRMAN said that with reference to the question of the deduction of income-tax on the 4 p.ct. debentures, they were in communication with the Board of Trade and were endeavouring to obtain sanction to exchange these for 5½ p.ct. debentures, so that the income-tax could be deducted without loss to the holders. As regards the 5 p.ct. preference shares, they had a letter from their Parliamentary Agents, stating that the Company were quite justified in paying the dividends on these without deducting income-tax, as the shares were issued before the Company became a statutory one.

A very hearty vote of thanks was accorded the officials and staff for their excellent work during the year, the expression being suitably acknowledged by Mr. J. CUFFLING (Secretary) and Mr. H. J. RANDALL (Engineer and Manager).

The annual meeting was followed by an extraordinary general meeting, at which the necessary resolutions were passed authorizing the Directors to make application to the Board of Trade for an order (1) to enable the Company to acquire the undertaking of the Twyford (Berks) Consumers' Gas Company, Ltd., and to confirm the agreement entered into with that Company; (2) to define and extend the limits of the supply of the Yorktown and Blackwater Gas Company; (3) to authorize the Yorktown and Blackwater Gas Company to enlarge and extend their existing gas-works, and for other purposes; (4) to authorize the creation and issue of preference shares and debentures for the purpose of acquiring such undertaking, and to increase the capital and borrowing powers of the Company.

Gas-Meter Robbery.—James Bradley (16) was charged at the Liverpool Police Court, on April 2, with stealing 6s. 5d. from the gas-meter at his home. The root cause, which had its result in the theft, appeared to be gambling. The magistrates warned him that if he got into trouble again he might be sent to Borstal.

Buxton Gas Prices Reduced.—The Gas Committee of the Buxton Corporation have decided to reduce the price of gas by 3d. per 1000 c.ft. after the March meter readings. The prices will then be as follows: For lighting, 3s. 11d.; for heating and cooking by separate meter, 3s. 8d.; and for gas-engines, 3s. 5d. per 1000 c.ft. The slot meters now set at 16 c.ft. will be reset at 18 c.ft. per penny; and the slot meter cash discount will be a penny in the shilling.

Londonderry Gas Light Company.—Mr. R. H. Smyth presided at the general meeting of the Company. The Chairman said that from a financial point of view the year's working had been satisfactory. Unfortunately, owing to bad trade and other causes, the gas consumption showed a decrease. Steps were being taken to remedy the antiquated plant, which was unsuitable and not adaptable to modern requirements. From April 1, the Company would commence to charge for gas by the therm. Dividends for the year were declared of 5 p.ct. on the original shares, and 3½ p.ct. on the new shares (less income-tax).

GLOVER & MAIN, LTD.

The Annual General Meeting of this Company was held on the 6th inst. in the Company's new showroom at No. 38, Grosvenor Gardens, S.W.—the CHAIRMAN (the Rt. Hon. T. McKinnon Wood) presiding.

The CHAIRMAN, in moving the adoption of the report and accounts, said: This is the first time we have met in our new showroom. An opportunity to dispose of the old showrooms on advantageous terms presented itself. The Directors had felt for a long time that the position was not the best for our customers, and that this district would be much more convenient. In addition, the change meant an annual saving. During the first half of 1922, through no fault of our own, we experienced considerable labour troubles. During the period under review, we have been entirely free from these, with the result that both the Company and the employees have reaped the benefit of uninterrupted work. The prices of materials used in our manufactures have remained fairly level during the past six months. Since the beginning of the year they have advanced. During the past two years, as the cost of production fell, we have repeatedly reduced prices to our customers. Despite these reductions our output has been well maintained. The progress of our business has been such that we have been compelled to make new extensions. At Falkirk the foundry has been extended to keep pace with the demand for our gas-cookers and fires. At Edmonton we have had to enlarge our storage accommodation. Last year we brought out the "Maintenance" cooker, which has been well received; and we have now added the new "Mainstay" cooker, which we believe will be equally popular. Shareholders are familiar with the "Author" series of gas-fires, which, for artistic appearance, quality, and heating efficiency are extremely satisfactory. With regard to meters, the first dry gas-meter was made by the firm in 1844, and we have kept abreast of the times in both ordinary and prepayment types. When due consideration is given to quality—which in the long run means economy—as well as to price, we do not fear competition. Last year I called attention to the unfair burden cast upon ordinary shareholders in limited liability companies by the corporation profits tax. I hope the strong and unanimous representations made by leaders of industry may influence the Chancellor of the Exchequer—himself a man of business—to remove this very unfair burden upon industry. During the period under review a great deal of time and thought has been devoted to careful examination of the methods and administration of our factories, to secure greater efficiency and economy. Some of the consequences of the great disturbance of the war, when our factories had to be adapted to a very different class of work, still (to a certain extent) remained with us. The Directors hope that the readjustments made will show permanent results to the benefit of the Company. I beg to move that the report of the Directors, and the accounts for the half-year ended Dec. 31, 1922, be adopted.

The VICE-CHAIRMAN (Mr. A. P. Main) seconded the resolution, which was put to the meeting and carried.

The following dividends were then declared: A dividend at the rate of 5 p.ct. per annum (less income-tax) for the half-year ended Dec. 31, 1922, on the £50,000 preference share capital. A dividend at the rate of 12 p.ct. per annum (less income-tax) for the same period on the £200,000 ordinary share capital.

Mr. A. P. Main and Mr. J. A. Maclay were re-elected Directors of the Company.

Mr. Maurice L. Wells (Chartered Accountant) was re-elected Auditor of the Company.

On the motion of Mr. G. N. WATERS, seconded by Mr. SAMUEL KNIGHTLEY, a vote of thanks was accorded to the Directors and the staff, which was responded to by the CHAIRMAN and the SECRETARY.

BRITISH EMPIRE EXHIBITION (1924).

Shipbuilding, Marine, Mechanical, and General Engineering Section.

We have received from the British Engineers' Association a ground plan showing the progress of space letting in their Shipbuilding, Marine, Mechanical, and General Engineering Section of the British Empire Exhibition, covering an area of 217,000 sq. ft. in the Machinery Hall. The first allotment of space was made a fortnight ago; and the coloured plan indicates in a striking manner the remarkable progress already achieved in the sale of stand space. While the general public have been somewhat bewildered by conflicting rumours about the exhibition and its prospects, the British Engineers' Association have evidently been getting on with their job in a workmanlike way, with the result that the organization of the Engineering Section is already so far advanced that success should be assured.

The space plan is accompanied by a schedule giving the dimensions, frontages, and prices of the stand spaces still available when the plan was printed. Firms who have not yet booked space, and desire to do so, should send in their applications without further delay, as the limited number of stand positions still available will be allotted on the basis of priority of application. Copies of the plan and schedule, and any other information required, can be obtained from the British Engineers' Association (Incorporated), No. 32, Victoria Street, London, S.W. 1.

Gas Poisoning at Derby.—A verdict of "Accidental Death" was returned at the inquest of Dora Whitehead, whose death occurred in the Derby infirmary. She was found unconscious in bed six days previous to her death. The gas tap was about a quarter open, and as it was set in scrollwork it was possible for it to have been unwittingly turned on after the light had been extinguished. Whitehead had been in poor health, and it was suggested that this is what occurred when she retired for the night. She had never been known to threaten suicide.

ASSOCIATION OF ENGINEERS-IN-CHARGE.

Early Incorporation Looked Forward To.

The Venetian Chamber at the Holborn Restaurant was well filled last Saturday evening, on the occasion of the twenty-third annual dinner of the Association of Engineers-in-Charge; and in addition to the large number of members, there were, as is customary on these occasions, many well-known guests supporting the President—Dr. H. S. Hele-Shaw, F.R.S., who occupied the chair. The Vice-Chair was filled by Mr. W. M'Laren, the Chairman of the Association. Some good speeches were interspersed in an excellent musical programme. The Chairman submitted the Loyal Toasts.

Research and Practice.

Captain H. Riall Sankey, C.B., C.B.E., proposing the toast of "Research and Practice," referred to the advantage that practice can derive from research. They all, he said, thought they knew what research was, and what practice was, though the definition given by each of them might be slightly different. He himself would define research as the obtaining of data by means of which they were able to construct the theories on which practice was improved day by day. There were two kinds of research—one which was entered into with no reference whatever to practical results, and the other which was always entered into because one wanted a definite result for practical purposes. The first kind of research was the foundation of all their work; and all the second kind was dependent on the first. The first kind often progressed a long way before the second kind was required. It was only when very great economy and efficiency were called for that one had to resort to the second kind of research. One of the homes of this kind of research was the National Physical Laboratory; and there was also the Committee for Scientific and Industrial Research. There were, in addition, many other organizations and firms carrying out researches. There was, however, always the possibility of undesirable overlapping. The Joint Engineering Council should be the people to arrange this kind of research, so as to avoid such undesirable overlapping, and at the same time promote desirable overlapping. At the present moment this Council consisted of the Institution of Civil Engineers, the Institution of Mechanical Engineers, the Institution of Electrical Engineers, and the Institution of Naval Architects. He looked upon this Council as being most important, and as something that would have a great effect upon engineering in this country; and he trusted it would put engineering in its proper place—which it did not occupy here to-day. He hoped to see all the other Institutions brought into the fold, according to their dimensions and importance in engineering matters.

Mr. F. Gill (the President of the Institution of Electrical Engineers) responded, and quoted a number of facts illustrative of the enormous progress made during recent years in the practice of telephone engineering—all of which he declared was due to research. He believed the Joint Council were going to do magnificent work. It was impossible to have only one Engineering Society; but they could, if they chose, have a great deal of co-operation between such organizations. Some forty years ago, lecturing at the Institution of Civil Engineers, Lord Kelvin remarked: "If you can measure a thing—if you can express it in numbers—you know something about it. If you cannot do this, your knowledge is of a meagre and unsatisfactory kind." He (the speaker) believed that the key to research was measurement—that was the ascertainment of facts and the measurement of facts. He did not think that anything like enough money was being expended upon research in this country. A good return could be had upon any amount of money that one cared to spend upon it. The profit was not only monetary, but in the lessening of human effort, and in the increase of human happiness and health. It was only by remaining to some extent in touch with the results of research that practicians could keep level with the work they had to try to handle.

Eng.-Vice-Admiral Sir George G. Goodwin, K.C.B. (President of the Institution of Marine Engineers), submitting "The Association of Engineers-in-Charge," remarked that the members were connected with a great variety of engineering branches; and if they could bring their experiences into a general fund, nothing but good all round could result. There were several ways of doing this. The reading and discussion of papers did a great deal of good. There was, he believed, a vast fund of information which was not thus realized. In the matter of disseminating experience, more might be done by conversation than even by the reading of papers. He suggested that experiences should be related in the form of short notes, for insertion in the official organ of the Association. If the members of different Institutions could be brought together for the interchange of views, this also must be productive of good.

The President, responding, said there was no doubt they had now recovered from the terrible set-back inflicted upon the Association, along with others, by the war. The activities of the Association were greater to-day than at any previous period. He was pleased to be able to tell them that incorporation of the Association was very nearly completed.

The toast of "Our Guests and Friends" was proposed by Captain H. J. Wellingham, M.C., and responded to in a very practical speech by Mr. H. Baines, C.B.E. (Chief Mechanical and Electrical Engineer to H.M. Office of Works).

Mr. W. M'Laren, submitting "The President," thanked Dr. Hele-Shaw for having occupied the chair a second time, and spoke of the high esteem in which he was held by the members. Captain A. E. Penn (the Hon. Secretary to the Association) supported the toast, and voiced the indebtedness of all to the President for the exceptional work he had done on behalf of the Association.

Reduction at Kirkby-in-Ashfield.—The Kirkby-in-Ashfield Urban District Council announce a reduction in the price of gas to all classes of consumers of 6d. per 1000 c.ft. The new rate to ordinary consumers will be 4s. 8d. per 1000 c.ft.

THE WORD "GAS."

The following letter has been addressed by Mr. William A. Kirkby, of Manchester University, to the Editor of the "Journal of the Society of Chemical Industry," arising out of an editorial note in that publication with reference to the origin of the word "gas."

There is no doubt that it was first used by Van Helmont (1577–1644), the occasion being in a work written by him and published after his death, "*Ortus Medicinæ*" (1648). He says: "*halitum illum Gas vocavi, non longe a chao veterum secretum*" ("I have called this spirit Gas, it being scarcely distinguishable from the chaos of the ancients"). He used the word in the course of his description of the gas now known as carbon dioxide, and prior to Van Helmont's time known as *spiritus silvestris*. There is no earlier indication of the derivation of the word "gas" than that given in "*Ortus Medicinæ*"; and the alleged derivation from the Dutch *geest* or German *geist*, *gascht*, or *gast* is one of much later date than the time of Van Helmont.

It was Joseph Priestley, in his work "Experiments and Observations on Different Kinds of Air" (1775), who ascribes to the word *geist* (spirit) the origin of "gas," and Cavallo, in his "Treatise on the Nature and Properties of Air" (1781), says: "The word *gas* is derived from the German *gascht*, or *gast*, which signifies an eruption of wind." When it is recalled that the alchemists described the gaseous state in such terms as *spiritus*, *flatus*, *halitus*, words signifying "wind" or "breath," and that in German this is rendered *geist*, it is easy to understand how Priestley accounted for "gas" as being derived from *geist*. The fact, however, is clear that a hundred-and-twenty-seven years prior to Priestley's book being published, Van Helmont, after remarking on the incoercible character of *spiritus silvestris*, and comparing it to the Greek *chaos*, invented the term "gas."

This has been followed by a letter from Mr. Leslie N. Brown, of West Kensington, in which he says:

I do not remember any text-book (except Mellor) that gives what I feel must be the correct derivation of the term. It is usually supposed to be derived from the German *geist*, spirit, and to be cognate with our word "ghost." This is certainly a very attractive and, at the same time, satisfying theory, but it would have been a simpler transition had van Helmont (who, by the way, was a Belgian) adapted the Old English "gast" from which "ghost" is derived. The admirable summary of the evidence given in Mellor's treatise seems to me entirely convincing. The Greek *chaos* signified the confused mass of elemental substance, and also space or atmosphere. Paracelsus used the word with a similar meaning. It must be remembered that van Helmont considered water to be the primal substance; and it was to the vapour rising from water (as well as to his "gas sylvestre") that he gave the name "gas," at the same time pointing out its analogy with the *chaos* of the ancients. The term "spirit" had been used for centuries to denote aëriform elastic fluids; and in the seventeenth century the word was in common use for several well-known gases. It is not surprising, then, that some should seek, quite ingeniously, to associate the new word with the German or Dutch equivalent for "spirit."

I should add that the Oxford English Dictionary makes no mention of the Teutonic derivation of the word.

TRADE NOTES.

Tully Gas Plants.

Tully Gas Plants, Ltd., have secured an order for a small-size Tully gasification plant for Thizy, in France. Their French agents are Sté. Anye. des Appareils de Manutention & Fours Stein, No. 48, Rue la Boetie, Paris.

Forced-Draught Furnaces.

Another good month's work in the supply of their forced-draught furnaces is reported by Messrs. Meldrums, Ltd., of Timperley, near Manchester. The concerns ordering these aids to fuel economy included three gas-works, three tar distilleries, and a corporation chemical works.

Water-Gas Plant for Synthetic Ammonia and Nitrates.

The Power-Gas Corporation, Ltd., have completed the construction and erection of a water-gas plant for Synthetic Ammonia and Nitrates, Ltd., of Billingham. The plant comprises three mechanical generators and auxiliaries, with a rated capacity of 6 million c.ft. of gas per day, and will represent the most modern practice in water-gas production on a large scale.

New Gasholder for Newcastle (N.S.W.).

Messrs. Wm. Coward & Co., Ltd., of No. 22, Buckingham Gate, Westminster, agents for the City of Newcastle Gas and Coke Company, Ltd., New South Wales, have been authorized by their principals to accept the tender of Messrs. Clayton, Son, & Co., Ltd., of Leeds, for the supply and erection of a two-lift telescopic guide-framed gasholder and steel tank, having a capacity of 500,000 c.ft. This holder has been specially designed to meet local conditions, and embodies many interesting features, including sheets of "Armco" iron, which it is expected will resist corrosive action better than the mild-steel sheets usually adopted. The work of designing the holder and drawing-up the specification was placed by the Directors of the Newcastle Company in the capable hands of Mr. P. C. Holmes Hunt, M.Inst.C.E., F.I.C., of Melbourne. Mr. Hunt, who is Consulting Engineer to many important gas concerns in the Commonwealth, and has great experience of conditions and practice in that country, is expected to visit England shortly. It is also interesting to learn that Mr. A. Langwill, who has been General Manager and Secretary to the City of Newcastle Gas Company for many years, is at present touring the Old Country.

Torquay Gas Company.

Major R. P. Kitson presided at the annual meeting of the Company, when the Directors reported a balance of £10,300 to the credit of the profit and loss account. The consent of the Board of Trade to the application for a Special Order under section 10 of the Gas Regulation Act, 1920, for amalgamation with the Paignton Gas Company was expected at an early date. In order to provide for the consolidation of the prior charges and for the general purposes of the Company's undertaking, the shareholders would be asked, as soon as the Order was made, to authorize the Directors to raise a sum of £30,000 by the issue of debenture stock. Moving the adoption of the report and accounts and the payment of dividends at the rates of 10 and 7 p.ct. less income-tax, the Chairman stated that in many ways they had had an epoch making year. The gas industry, in common with many others, had not been free from criticism; but it was common knowledge that the recent Government inquiry had proved that the method of charging for gas by the therm was in the interests of the consumers. So far as this Company were concerned, the only result had been to add to the trouble and expense of gas production. Referring to the revenue account, the Chairman said manufacture showed a decrease of about £8500, notwithstanding the increase in the cost of repairs and maintenance. The revenue from gas had decreased. This was solely due to the lower price, as the quantity consumed had increased by 22,000,000 c.ft. The gross profit shown, £9173, was satisfactory; but as this was subject to income-tax and other items, the net profit for the year was reduced to the sum of £4753. He pointed out that in reducing the price of gas in the last twelve months by 5d. per therm they had done well. One of the largest and most influential gas companies in the kingdom charged 9d. per therm. The Company's price was 10d., which, having regard to their distant coalfields and other sources of supply, made the comparison wholly favourable.

Development of Gas Supply in Lanarkshire.

The Middle Ward District Committee of Lanarkshire have taken control of the gas-works at Cambuslang, Bothwell and Uddingston, Bellshill and Mossend, Holytown, and Larkhall, and in pursuance of the policy of further developing the gas supply of the district, it is now proposed to undertake the supply of gas on the Strathaven district. In a note on the subject prepared by Mr. W. E. Whyte, the District Clerk, for the information of the District Committee, it is stated that the Strathaven Gas Company have 1134 consumers, of whom 384 have slot meters. The present price of gas is 7s. 6d. per 1000 c.ft. The price in 1914 was 3s. 6½d. While the scheme of gas supply for the Middle Ward District embraces Strathaven, the Consulting Engineer (Mr. Doig Gibb), in a report dated May 1, 1922, dealing with the development of the scheme, suggested that what he termed the "inner area," embracing Uddingston, Cambuslang, Bellshill, Holytown, Blantyre, and Larkhall, should be dealt with and completed first. The high-pressure main has now been laid to Larkhall, and an extension of the general scheme to Strathaven would mean the laying of necessary mains through Stonehouse. It would be essential, therefore, to consider both places at the one time. Stonehouse is about 3¾ miles distant from Larkhall, and Strathaven about 7½ miles. A 5-in. main from Larkhall, with a 3-in. junction pipe for about a quarter of a mile to Stonehouse Gas-Works, would probably cost £4000; and a 4-in. main from the 5-in. main to Strathaven would probably cost £3500—making a total of £7500. As regards the present supply at Strathaven, difficulties have been experienced with the local Gas Company in connection with the introduction of gas to the housing scheme. Certain proposals were submitted to the Board of Health, but of these the Board disapproved. The Board can only agree to the Local Authority giving the gas undertakers a guarantee on certain lines laid down by the Treasury. The terms of the arrangement which would be sanctioned are that the Local Authority should guarantee to the Gas Company an annual return not exceeding 7 p.ct. of the capital cost incurred, less a rebate of 1s. per 1000 c.ft. of gas consumed for a period not exceeding five years. Generally, this proposal is unacceptable to gas companies. An alternative proposal was submitted to the District Committee in several other cases—viz., that the District Committee should agree to bear a modified proportion of the cost of laying the necessary mains—usually fixed on the basis of the Committee digging and filling in the tracks within the housing scheme itself—under an arrangement that the District Committee will be reimbursed for the sum so paid by them out of the rents receivable from the houses at the rate of 10s. per house per annum until the sum is paid off. This arrangement was suggested in view of the fact that in the Viewpark case the Rents Tribunal, in fixing the rents, decided that the rents of houses to which gas had not been introduced were to suffer a reduction of 10s. per annum. The District Committee have agreed to this proposal in the cases submitted to them, and recently it was suggested to the Secretary of the Strathaven Gas Company (Mr. Barrie) that, in view of the considerable reduction in prices since the proposals were first discussed, it might be possible to arrange an agreement with them on the same lines. It was agreed that the Manager of the Company should consider further the question of costs, and that a meeting should be arranged for discussion.

Whitwell's Satisfaction at Cheaper Gas.—At the annual meeting of the Whitwell parishioners, general satisfaction was expressed at the announcement that the Gas Company had decided to reduce the price of gas from 5s. 11d. to 5s. 6d. per 1000 c.ft., and in addition to allow a rebate for the ensuing quarter of 5d. per 1000 c.ft.

Theft from Gas-Meters.—At the Barnsley Police Court, Thomas E. Griffin and Harry Harris, miners, of Cudworth, were each sent to prison for one month on a charge of stealing 15s. 5d. from two gas-meters. It appeared that Griffin visited Harris at the house of Mrs. Thompson, where Harris lodged. While Mrs. Thompson was absent the defendants found a key and opened the meter. Griffin subsequently left the district and was arrested at Coalville, near Leicester. The sum of 10s. 5d. was also missed from the meter at the house where Griffin lodged.

THE NORTH-EAST COAST COAL TRADE.

From Our Own Correspondent.

The chief feature of the past short working week has been congestion at the loading places. All of them have been so blocked up with waiting tonnage, and boats which had been expected to berth this week have been so put back, that collieries have had an anxious time in many cases with regard to keeping the pits working. The same story is reported with reference to Continental ports of discharge; and the general result has been that one or two cargoes have been available on the market at reduced rates.

Requests from German receivers to postpone delivery in several instances have made merchants on this side wonder whether congestion at the ports is the real cause, or whether the German position is weakening at all. So much coal has been sold for Germany for the next six months or so, that failure to take it out would affect this market considerably, even if the German miners took some time to get into their stride.

Collieries are, however, still optimistic about the future, and open negotiations on a basis of over 30s. for the second half of the year. It is not uncommon to hear sellers suggesting 32s. 6d., and would-be buyers talking about 27s. 6d. So with a 5s. margin, business is not easy to fix up. This all points to the fact that collieries are sufficiently well sold up to the end of the year to be able to chance the market rather than make any substantial reductions in their prices at present.

The demand for coking coal for the Continent generally is still very strong, and merchants are often willing to pay as much as 2s. extra on the price of other sorts they had bought if the collieries can give them coking instead. Good quality smalls even ask 35s. for any odd prompt lots they may have available.

Quotations for gas coal are nominally about 32s. 6d. for seconds, and 35s. for bests and specials, though they will negotiate for the second half of the year at perhaps 2s. 6d. less than this.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From a Local Correspondent.

Owing to the holidays and the more extensive shipping demands, gas concerns are for the moment rather "tight" for supplies. With the approach of warmer weather and the longer days, however, the situation will tend to become easier. Producers in Yorkshire and Lancashire do not seem inclined to quote ahead. With regard to the coal trade generally, the position as to household fuel is normal, with the likelihood of an easier situation. There is no improvement in the consuming industries, and collieries generally are disposing of the bulk of their supplies for export. How long this position will continue depends on the situation in the Ruhr.

The Hull market at the week-end was unsettled. There was no improvement in facilities for getting coal from the pits to the docks. Shipments on Wednesday were 19,845 tons from Hull, 3800 tons from Grimsby, and 10,800 tons from Immingham—a total of 34,445 tons. As there are vessels carrying up to 5000 or 6000 tons, the total export shows that few ships are cleared in one day. The loss to the exporters is very serious. It is estimated that they have had to sacrifice in demurrage during the past week or so about £15,000 on pre-Easter orders. There is no lack of coal at the pits—the difficulty is to get it carried to the hoists at the docks. Exporters are therefore reluctant to take orders. Prices are normal. For forward shipment, the demand is quiet.

COAL TRADE IN THE MIDLANDS.

From Our Local Correspondent.

Values tend to harden. In cases where contract prices have been revised for the March-June quarter, purchasers have had to concede an advance of about a shilling per ton. They have not done so willingly; but where collieries have insisted, their customers have thought it wisdom to acquiesce. As previously stated, a large number of collieries have not sought to disturb the price basis agreed upon last summer. In a few special cases contracts have been negotiated for the 1923-4 period. As the circumstances are exceptional, the transactions afford no useful index of the market position. The Easter holiday has entailed a greater intermission of output at the pits this year than last, or it may be that the increased pressure for supplies has made it more apparent. Owing to delayed deliveries some gas undertakings have had to draw upon their reserves, and there have been protests. However, the lengthening of the holiday has given opportunity to accumulate empty wagons at the pit-heads, and so prepared the way for unhampered operations. There are indications that the drain of coal to the Humber is abating somewhat.

Coke supplies appear to be as short as ever. A further aggravation of the famine conditions is threatened by the trouble in South Wales; but at the time of writing none of the collieries has notified any special difficulty. The coke-ovens at the Birmingham Gas-Works, which were temporarily disabled by the explosion on March 4, are making full production again.

The estimated net profits from Blackpool's trading departments for next year include, from gas, £4645 against £23,534 last year. From the profits of last year there was a special vote of £2000 for the forthcoming June carnival.

The Stockton Corporation Gas Committee have a balance of £1484 to place to reserve account, after making a contribution towards the cost of retorts of £6646. This payment wipes-off the total amount of capital expenditure out of revenue to provide for the reconstruction of the gas-works. Further, the price of gas has been reduced from 4s. to 3s. per 1000 c.ft.

STOCK MARKET REPORT.

The short four-day week on the Stock Exchange was long enough to exhibit varying tendencies. The opening on Tuesday was quiet and inactive, there being many absentees; but the tone was quite cheerful, especially in choice lines. Home Governments were very strong; the big four closing thus: Consols 59⅛-59½, War Loan 102⅛-102 $^{9}/_{32}$, Funding 90⅜-90$^{3}/_{4}$, Victory 92⅛-92⅜. Indian were higher. Home Rails were strong and active, but easier at the close; and Canadian and Argentine were firm. The Foreign Market had some good points in French, Argentine, Brazilian, Chinese, and Peruvian; but Greeks and Turks were down. In Miscellaneous, Oils and Rubbers were in demand.

Business in the Gas Market was much quieter, surrendering to holiday claims, but showed unbroken firmness. Many issues were advanced, some of them with conspicuous figures; while none suffered a reduction. In the London Companies, Gas Light ordinary rose 4½, ditto maximum 1½, and debenture 1, South Metropolitan ordinary 3½, preference and 6½ p.ct. debenture 1 each. In Suburban and Provincial, Brentford debentures rose 3, Bristol 1, Newcastle ½, Wandsworth "A" 5, "B" "C" and new 3 each, Wimbledon 2, and Epsom 5, Tynemouth 3. In the Continentals, Imperials rose 5. Melbourne debenture rose 2½.

The following transactions in gas during the week were recorded: On Tuesday, Brentford "A" 97, Commercial 4 p.ct., 93⅞, European 8¾, Gas Light ordinary 94, ditto 4 p.ct. preference 79½, 79¼, 80, Imperial Continental 162½, 164½ Primitiva 10s., 10s. 3d., ditto 5 p.ct. preference 38s. 6d., South Metropolitan 95⅛, 95½, 95⅝, South Suburban 99, 100¼, Tottenham "B" 100¼, Brighton and Hove 5 p.ct. debenture 77, Weymouth Consumers 3½ p.ct. debenture 62, Wandsworth 5 p.ct. preference 99. On Wednesday, Bristol 91⅞, Gas Light ordinary 94½, 94⅞, 95, 95⅛, 95⅛, ditto 4 p.ct. preference 80, Imperial Continental 163, 165, Primitiva 5 p.ct. preference 37s. 6d., 38s. 7½d., 39s. 6d., South Metropolitan 95⅜, 96, Tottenham "B" 100⅛, Wandsworth new 102, 102½, ditto 5 p.ct. preference 98¾, 99, Mid Kent 39s., 40s. On Thursday, Brighton and Hove original 164, Buenos Aires debenture 56⅛, European 8$^{11}/_{16}$, 9, Gas Light ordinary 94⅛, 95, 95$^{1}/_{8}$, 95$^{3}/_{8}$, 95⅛, 95$^{3}/_{4}$, 96, 96⅛, 97, ditto 3½ p.ct. maximum 65½, ditto 3 p.ct. debenture 62, 62½, ditto 10 p.ct. bonds 185, 192, Imperial Continental 163½, 165, Primitiva 5 p.ct. preference 38s. 38s. 6d., South Metropolitan 95⅛, 96, 96⅛, ditto 6½ p.ct. debentures 106½, Wandsworth 5 p.ct. preference 98¾, 99, Hartlepool 5 p.ct. 87, 87½, Southgate District 5 p.ct. preference 86⅜, 87½. On Friday, Brentford "A" 98, ditto 4 p.ct. debenture 78, European 8½, 8¾, 8⅞, Gas Light ordinary 96½, 96⅝, 97, 97½, 97⅛, 98, 98⅛, 98⅛, 99, ditto 3½ p.ct. maximum 66½, ditto 3 p.ct. debenture 62, 62½, Imperial Continental 166, 167, 168, Primitiva 10s., ditto 5 p.ct. preference 39s. 6d., South Metropolitan 96¾, 97⅛, 98⅛, ditto 6½ p.ct. debenture 105⅜, South Suburban 101, Tottenham "B" 101, 101¼, Wandsworth New 102, 102⅛, 102½, ditto Wimbledon 110, 110¾, 111, ditto 5 p.ct. preference 98¾, 99, ditto 4 p.ct. debenture 81⅜, Mid Kent 34s., Hornsey 5 p.ct. preference 86½. In the Money Market, things were rather exciting, with almost violent fluctations which had not been calculated for. But a fairly sharp demand lasted up till Friday, when supplies came in to relieve the position. Discount rates held steady awhile; but they, too, gave way before the close. Silver dropped upon Eastern sales. The Bank of England rate was 3 p.ct., as fixed on July 13.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S TRANSACTIONS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Transactions.
£			p.c.					
131,978	Stk.	Feb. 22	—	5%	Aldershot 5 p.c. max. C.	..	74—79	...
190,492	,,	,,	4	4%	Do. 4 p.c. Pref.	..	68—73	...
1,551,868	,,	Apl. 5	2½	5%	Alliance & Dublin Ord.	59—64	57—60*	...
374,000	,,	Jan. 11	4	4%	Do. 4 p.c. Deb.	76—79	60—65	...
280,000	5	Oct. 19	7½	4/-	Bombay, Ltd.	5⅛—6⅛	4⅛—5	...
100,000	5	Feb. 22	16	8/-	Bournemouth Gas and Water (5 p.c. / B 7 p.c. / Pref. 6 p.c. / 4 p.c. Deb.)	..	11—12	...
383,110	10	,,	7	7/-		15—15⅛	11—12	...
115,000	10	,,	6	6/-		13⅛—14	9—10	...
162,065	—	Dec. 29	—	4%		..	71—76	...
992,045	Stk.	Feb. 22	14	6⅛/-	Brentford A Consolid.	261—266	95—98	97—98
734,920	,,	,,	11	6⅛/3	Do. B New	204—209	95—98	...
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	85—90	...
221,400	,,	Dec. 14	4	4%	Do. 4 p.c. Deb.	91—93	78—83	78
214,775	,,	Mar. 8	11	11%	Brighton & Hove Orig.	208—213	163—168	164
244,200	,,	,,	8	8%	Do. A Ord. Stk.	154—159	117—122	...
1,272,500	Stk.	Feb. 22	5	5%	Bristol 5 p.c. max.	..	90—93	91⅛
570,000	20	Mar. 22	12½	20/-	British	44—45	38—40	...
10,000	10	Dec. 29	—	7/-	Do. 7 p.c. Pref.	..	12—13	...
120,000	Stk.	June 29	4	4%	Do. 4 p.c. Deb. Stk.	88—90	75—80	...
220,335	,,	Dec. 29	4	4%	Buenos Aires 4 p.c. Deb.	85—87	55—58	56⅛
100,000	10	Nov. 2	—	—	Cape Town & Dis., Ltd.	1⅛—2⅛	6½—7⅛	...
100,000	10	Oct. 19	—	—	Do. 4⅛ p.c. Pref.	4—6	6—7	...
100,000	Stk.	Dec. 29	4⅛	—	Do. 4⅛ p.c. Deb. Stk.	70—75	72—77	...
237,860	,,	,,	—	7⅛%	Cardiff 7½ p.c. Deb.	..	107—112	...
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	..	...
1,513,280	,,	Mar. 8	5/9/4	60/-	Commercial 4 p.c. Stk.	106—108	92—95	93⅞
560,000	,,	,,	5⅛	60/-	Do. 3⅛ p.c. do.	103—105	92—95	...
475,000	,,	Dec. 14	3	3%	Do. 3 p.c. Deb. Stk.	69⅛—71⅛	55—60	...
800,000	,,	Dec. 15	4	—	Continental Union, Ltd.	76—79	25—30	...
200,000	,,	Dec. 14	7	4%	Do. 7 p.c. Pref.	115—118	55—60	...
660,000		Mar. 8	—	6%	Croydon allding scale.	..	100—103	...
284,975			—	5%	Do. max. div.	..	82—85	...
492,270	Stk.	,,	6	4⅛%	Derby Con. Stk.	123—125	..	...
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	..	...
209,000	,,	Apl. 5	—	5%	East Hull 5 p.c. max.	..	8⅛—9½	8⅛—9
1,002,180	10	Jan. 25	10	5/0	European, Ltd.	17⅛—18	98—100	94⅛—99
16,546,120	Stk.	Feb. 8	4/17/4	32/-	Gas Light & Coke (4 p.c. Ord / 3½ p.c. max. / 3 p.c. Con. Pref. / 3 p.c. Con. Deb. / 10 p.c. Bonds / 7⅛ p.c. Ilford Deb)	98—102	65⅛—67½	65⅛—66⅛
2,600,000	,,	,,	3⅛	35/-		76—79	78—80	79⅛—80
4,062,235	,,	,,	4	4%		96—99	61—64	62—62½
4,761,930	,,	Dec. 14	3	3%		72⅛—74⅛	..	185—192
130,000	,,	Dec. 11	10	10%		..	..	...
—	—	—	—	—		..	..	...
82,500	,,	Mar. 8	5	65/7½	Hastings & St. L. 5 p.c.	..	92—97	...
258,740	,,	,,	3⅛	50/7½	Do. 3⅛ p.c.	87—89	75—78	...
70,000	10	May 18	11	7½%	Hongkong & China, Ltd.	16⅛—16⅛	6—7	...
86,600	Stk.	Mar. 8	9	9½%	Hornsey 7 p.c.	..	135—140	...
1,976,000	,,	Nov. 16	9	£5	Imperial Continental	150—160	165—170	162½—168
404,800	,,	Feb. 8	3⅛	3⅛%	Do. 3⅛ p.c. Deb. Red.	84—86	75—78	...
335,242	,,	Mar. 8	6½	6⅛%	Lea Bridge Ord. 5 p.c.	119—121	93—98	...
2,498,905	,,	Feb. 26	10	37/6	Liverpool 5 p.c. Ord.	..	..	...
600,000	,,	Mar. 22	—	7%	,, 7 p.c. Pref.	..	102—104	...
165,736	,,	Feb. 22	7/5/6	80/-	Maidstone 5 p.c.	..	107—112	...
63,480	,,	Dec. 29	—	3%	Do. 3 p.c. Deb	..	53—58	...
75,000	5	June 29	6	6%	Malta & Mediterranean Met. of Melbourne (4⅛ p.c. Deb.)	4⅛—4⅛	3⅛—3⅛	...
100,000	100	Apl. 5	4⅛	4⅛%		99—101	97—100*	...
541,920	Stk.	Nov. 30	4	4%	Monte Video, Ltd.	11⅛—12	52—57	...
1,875,892	,,	Feb. 22	4⅛	5⅛%	Newcastle & Gatsh'd Con.	98⅛—99⅛	79⅛—80⅛	...
250,166	,,	,,	—	4%	Do. 4 p.c. Pref. Stk.	..	76—78	...
329,705	,,	Dec. 29	3⅛	3⅛%	Do. 3⅛ p.c. Deb.	82—83	68—69	...
15,000	10	Aug. 26	—	7/6	North Middlesex 10 p.c.	..	..	...
55,940	10	Mar. 8	7/14/0	7/8⅜	,, ,, 7 p.c.	14—15	10⅛—11⅛	...
300,000	Stk.	Nov. 30	8	8%	Oriental, Ltd.	117—122	97—102	...
188,120	Stk.	Dec. 29	—	72/6	Piym'th & Stonh'se 5 p.c.	..	94—99	...
60,000	50	Mar. 8	13	65/-	Portsea Island, B	128—131	98—103	...
100,000	50	,,	12	60/-	Do. C	118—121	95—102	...
290,069	5	—	8	—	Primitiva Ord.	5⅛—6	⅛—⅜	10/—10/3
499,960	5	—	5	—	Do. 5 p.c. Pref.	4⅛—5	1⅛—2⅛	37/6—39/6
521,600	100	Nov. 30	4	4%	Do. 4 p.c. Deb.	91—93	70—73	...
600,000	Stk.	Jan. 25	4	4%	Do. ,, ,, 1911	..	55—58	...
346,198	,,	Dec. 29	4	4%	River Plate 4 p.c. Deb.	85—87	55—58	...
150,000	10	Mar. 22	6	6/-	San Paulo (6 p.c. Pref. / 5 p.c. Deb.)	10⅛—11	5⅛—6	...
125,000	50	July 3	5	5%		47—49	36—38	...
135,000	Stk.	Mar. 22	10	5%	Sheffield A	223—224	93—96	...
209,984	,,	,,	10	5%	Do. B	222—224	93—96	...
523,500	,,	,,	10	5%	Do. C	220—229	93—96	...
133,201	Stk.	Sept. 15	4	4%	Shrewsbury 5 p.c.	..	..	...
90,000	10	Nov. 2	9	7%	South African	10⅛—11⅛	7—9	...
6,609,895	Stk.	Feb. 22	5/4/0	60/-	South Met. Ord.	111—113	97—100	95⅛—98⅛
250,000	,,	Jan. 11	—	5%	Do. Red. Pref.	..	96—98	...
1,895,445	,,	,,	3	3%	Do. 3 p.c. Deb.	72⅛—74⅛	60—62	...
734,000	,,	Mar. 8	—	6⅛%	Do. 6½ p.c. Deb.	..	105—107	105⅛—106⅛
91,500	,,	Feb. 22	8⅛	8⅛%	South Shields Con. Stk.	157—159	113—117	...
1,087,795	,,	,,	6	6%	S'th Suburb'n Ord. 5 p.c.	114—116	98—101	99—101
368,837	,,	Dec. 29	5	5%	Do. 5 p.c. Deb. Stk.	116—118	93—98	...
647,740	,,	Nov. 2	5	7%	Southampton Ord.	99—102	84—87	...
121,275	,,	Dec. 29	4	4%	Do. 4 p.c. Deb. Stk.	..	68—73	...
250,000	,,	Mar. 8	—	70/-	Swansea 7 p.c. Pref. Stk.	..	102—104	...
200,000	,,	Dec. 29	—	6⅛%	Do. 6½ p.c. Deb. Stk.	..	102—104	...
120,000	,,	Feb. 22	—	7⅛%	Tottenham (A 5 p.c. / B 3½ p.c. / 4 p.c. Deb.)	135—138	109—114	...
782,275	,,	,,	6	6%		115—117	100—103	100¼—101⅛
181,255	,,	Dec. 14	4	4%		87—89	75—80	...
258,251	Stk.	Mar. 22	5	5%	Tynemouth 5 p.c. max.	108⅛—109	90—92	...
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	Feb. 22	8⅛	87/6	Wandsworth A 5 p.c.	151—156	130—135	...
235,636	,,	,,	6⅛	72/6	Do. B 3½ p.c.	129—134	115—120	...
108,075	,,	,,	—	61/3	Do. C.	..	100—105	...
140,865	,,	,,	—	61/3	New Ordinary	..	100—105	102—102⅛
352,000	,,	,,	6⅛	68/9	Wimbledon 5 p.c.	117—122	109—114	110—111
98,000	,,	,,	6⅛	73/9	Epsom 5 p.c.	121—126	115—120	...
88,416	,,	Dec. 29	3	3%	3 p.c Deb. Stk.	66—69	56—59	...

* Ex Div.

SHARES FOR SALE.

IMPORTANT SALE by Auction of 7000 £1 "ADDITIONAL" SHARES in the

WELLINGBOROUGH GAS LIGHT COMPANY, LTD.,

BY

MESSRS. PENDERED & SON, LTD.,

At the HIND HOTEL, WELLINGBOROUGH,

On WEDNESDAY, 18th April, 1923,

At 5 for 6 o'clock in the Evening,

In convenient Lots to suit Purchasers, and pursuant to the Wellingborough Gas Order, 1922.

The Shares will bear dividend as from the 1st day of July, 1923, and every share sold will be allotted to the purchaser by the Directors upon the price being paid in accordance with the Conditions of Sale.

The Share Capital of the Company has remained unchanged since 1905. In this period the yearly gross revenue has increased from £23,611 to £76,290.

There are no Preference Shares in the Company, and all Shares rank for dividend according to their relative nominal value.

The Company has obtained an Order under the Gas Regulation Act, 1920, which fixes the standard price at 15 2-5d. per therm. At this price the standard dividend payable on the "Additional" Shares is 7 per cent. per annum. This dividend may be increased by ½ per cent. for every fifth of a penny per therm by which the price of gas is reduced. The price of gas last half-year was 11 2-5d. per therm, and the Dividend paid was at the rate of 12 per cent. per annum. A further reduction in the price of gas has since been made.

Printed Particulars, which have been filed as a Prospectus with the Registrar of Joint Stock Companies, and Conditions of Sale, may be obtained of the Auctioneers, Wellingborough (Tel. 49); of Mr. A. S. Campbell, the Gas Company's Offices, Commercial Place, Wellingborough (Tel. 125); or of Messrs. Sharman, Jackson & Archer, Solicitors, West End House, Wellingborough (Tel. 187).

CURRENT SALES OF GAS PRODUCTS.

Tar Products in the Provinces.

April 9.

The average values for gas-works products during last week were: Gas-works coal tar, 115s. to 120s. Pitch, East Coast, 185s. to 190s. f.o.b. West Coast—Manchester, 180s. to 185s.; Liverpool, 181s. to 186s.; Clyde, 182s. 6d. to 187s. 6d. Benzole 90 p.ct., North, 1s. 6d. to 1s. 6½d.; crude 65 p.ct. at 120° C., 1s. to 1s. 0½d. naked at makers' works; 50-90 p.ct., naked, North, 1s. 8d. to 1s. 8½d. Toluole, naked, North, 1s. 11d. to 2s. nominal. Coal tar crude naphtha in bulk, North, 8½d. to 9d. Solvent naphtha, naked, North, 1s. 8d. to 1s. 10d. Heavy naphtha, North, 1s. 6d. to 1s. 8d. Creosote, in bulk, North, liquid, 8½d. to 8¾d.; salty, 7½d. to 8d. Scotland, 7d. to 7¼d. Heavy oils, in bulk, North, 7d. to 7½d. Carbolic acid, 60 p.ct., 4s. to 4s. 2d. prompt, 3s. 10d. to 4s. forward. Naphthalene, £15 to £16; salts, £6 to £8, bags included. Anthracene, "A" quality, 4d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

Luton Gas Company.

The annual meeting was held a week last Tuesday, the Rev. C. E. Mees presiding. The Chairman presented the accounts for the year ended Dec. 31, 1922. The quantity of gas sold showed a decrease, as compared with the year 1921, of 3·96 p.ct. Owing to the smaller consumption and the lower average cost at which gas was sold, the revenue from this source was less than that of the previous year by £5535. Residuals also realized a smaller amount—£47,193, as compared with £60,807. On the other hand, coal showed a reduction in cost of over £29,000. The price of gas had been reduced twice during the year—namely, from 5s. per 1000 c.ft. to 10d. per therm (4s. 1d. per 1000 c.ft.) from Lady Day, and from 10d. to 8 3·5d. per therm (3s. 6·14d. per 1000 c.ft.) from midsummer. The Directors stated that the price will be further reduced from the meter readings at Lady Day, to 8d. per therm. The Directors recommended the payment of the following dividend (less income-tax) for the six months ended Dec. 31: 2 p.ct. on class "B" preference shares; £2 10s. p.ct. on class "C"; £8 5s. p.ct. on class "A" ordinary shares; £6 15s. p.ct. on class "D"; £4 2s. 6d. p.ct. on class "F"; and to carry £577 to the reserve fund account. Mr. Gates moved a vote of thanks to the Chairman and the Directors and to the Engineer and his staff for their work during the past six months. Mr. William Phillips, after returning thanks on behalf of himself and his staff, said that the Company was going along very steadily, and they were always trying to reduce the price of gas to the consumer. The present price was very low—among the lowest in the Midlands and the South. He believed there was only one company which charged a lower price than Luton.

Progress of Gas Supply.—According to figures appearing in the "American Gas Journal," there were at St. Paul (Minn.), in 1857, 72 customers consuming gas drawn from three miles of mains; and they were paying for it $6 per 1000 c.ft. At the present time the consumers of the St. Paul Gas Company number 55,876, who pay $1 per 1000 c.ft. for the gas; while the mains laid in the city extend to a length of 444 miles. Gas was at first used only for store and residence illumination; street lighting was not introduced until 1861. The original gas plant had a capacity of about 15,000 c.ft. per day; and a record of the first full year's operation by the Gas Company mentions the output as 3,727,000 c.ft., which amount is not quite half of the present consumption in one day. The gas coal used was bought at Pittsburgh, and shipped down the Ohio and up the Mississippi; the cost being $34 a ton.

New Capital for the Uxbridge Gas Company.—Messrs. A. & W. Richards have been instructed by the Directors of the Uxbridge, Wycombe, and District Gas Company to offer for sale by tender £60,000 of new capital, comprising £30,000 of 4½ p.ct. perpetual debenture stock (at the minimum price of £85 p.ct.), £15,000 of 5½ p.ct. perpetual preference stock (at the minimum price of par), and £15,000 of ordinary stock (at the minimum price of £95 p.ct., at which the present yield will be £6 11s. 7d. p.ct.). The money will be used in repayment of an overdraft obtained from the Company's bankers for extensions of the works, mains, &c. The Company were established in 1854 as the Uxbridge and Hillingdon Gas Consumers' Company, and were incorporated by Special Act in 1861. Further powers have been obtained in subsequent years, which included authority to acquire the undertakings of the High Wycombe, Eton, and Great Marlow Gas Companies. The statutory area of the combined undertakings now covers about 197 square miles. The Company supply through 159 miles of mains 16,865 consumers, and the sales of gas last year were 1,748,381 therms, equivalent to 380 million c.ft. As from Jan. 1 last, the selling price was reduced to 15d. per therm.

Cheaper Gas at Doncaster.—The Doncaster Gas Committee have decided to reduce the price of gas by 6d. per 1000 c.ft.

Wellingborough Gas Company's Additional Capital.—As will be seen from an announcement which appears elsewhere in this issue, Messrs. Pendered and Son, Ltd., will, on Wednesday next, at the Hind Hotel, Wellingborough, offer for sale by auction 7000 £1 additional shares in the Wellingborough Gas Light Company, Ltd.

Gas-Cookers as Cupboards.—It was stated at a meeting of the Strabane Urban District Council, by Mr. G. Browne, J.P. (the Chairman), that a great many people in the town were anxious to get gas-cookers. A number of those who had cookers were not using them as such, but as cupboards—for holding old boots and all sorts of household articles. The cookers in these cases ought to be removed and given to persons who would use them for the proper purpose.

Waterford Gas Dispute.—The dispute at the Waterford Gas-Works, arising from the men's demand for the retention of fourteen men under notice of dismissal, and the claims of rival unions as to the right to handle coals, is still unsettled; and the city remains, for the fourth week, without a gas supply. A conference was held last week in hope of securing a settlement, but there was no result; and the men now attribute the deadlock to a proposal of the Company to reduce the number of workers and put the stokers on a twelve-hour day instead of eight hours. Mr. Ellacott (the Manager), who has been boycotted by the strikers, recently expressed the view that if the dispute did not end soon, there would be no option left the Directors but liquidation. Consequent on the working loss of last year, Mr. Ellacott introduced various economies. The citizens, needless to say, are at grievous loss by the absence of a gas supply.

Deficient Calorific Power at Whitwell.—The Chief Gas Examiner has imposed a penalty upon the Whitwell (Derbyshire) and District Gas Company for failing to supply gas of the declared calorific value. At a meeting of the Creswell Parish Council, a letter was received from the Chief Examiner stating that the average calorific value of the gas supplied by the Whitwell Company for the last quarter was 22·4 B.Th.U. below the declared value of 500 B.Th.U. In accordance with the Gas Regulation Act, he found that during the quarter ended Dec. 31, 1922, the revenue of the Company had been improperly increased by £58 15s., which sum would have to be applied in accordance with the Act. The report of the Examiner on his visit to the Whitwell Gas-Works on Feb. 27 last states that the calorific value of the gas was 53 B.Th.U. above the declared value.

Dublin Gas and Meter Testing.—The Dublin Public Lighting Committee, in a report to the Corporation, express the view that, during the reorganization of the Council's departments, an effort should be made to get the Free State Government to take over the control of the gas-testing and meter-testing branches of the Municipality. The Law Agent had agreed that the suggestion was a very good one, inasmuch as the Corporation had always had great difficulty in succeeding in any proceedings against the Alliance and Dublin Gas Company based upon gas testing; but be explained that the Government would require to introduce new legislation to deal with the matter, a number of enactments having to be reviewed by Parliament before any arrangement as to transferring control could be carried out. The Law Agent was also of opinion that a certificate coming from a Government official would have more weight with the Courts than a similar certificate from a Corporation official. The Committee ask the Corporation to empower them to take-up the matter with the Government on the lines indicated.

Calorific Standard at Burnley.—A suggestion having been made that the calorific power of the gas supplied by the Burnley Corporation should be increased from 475 to 500 B.Th.U., Mr. J. P. Leather (the Gas Engineer) prepared a report, which has been approved without comment by the Town Council. In this, Mr. Leather says that the increase of calorific power would be best obtained by the use of a greater quantity of gas oil in the manufacture of the carburetted water gas, which is at present of lower calorific power than the coal gas. Assuming the number of therms sold to be unaltered, the cost of the gas would be increased by about £550. He does not think, however, that it is advisable, in present circumstances, to alter the calorific power of the gas. It is difficult to ensure that the quality would be always maintained, as it is impossible to prevent variations in manufacture being felt in the town, on account of the deficiency in storage capacity. When the new holder has got to work next year, the subject might be reconsidered. It must be remembered that an alteration in quality means the re-adjustment of consumers' appliances throughout the town. When the quality was increased before, there were many complaints of smell from the combustion of gas.

The Bradford Corporation Gas Committee have been informed that the laying of new gas-mains as a form of relief work for the unemployed has received the approval of the Unemployed Grants Committee and of the appropriate Government Department.

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